CHAPTER 12
ELECTRICAL

GENERAL INFORMATION 12.3
SPECIAL TOOLS / ELECTRICAL SERVICE NOTES 12.3
COMPONENT LOCATIONS 12.3
INSTRUMENT CLUSTER (XP EPS MODELS) 12.4
RIDER INFORMATION DISPLAY 12.5
SPEED INFORMATION 12.6
INFORMATION DISPLAY AREA 12.6
DIAGNOSTIC MODE 12.8
INSTRUMENT CLUSTER PINOUTS 12.9
INSTRUMENT CLUSTER (XP / X2 / TOURING MODELS) 12.10
RIDER INFORMATION DISPLAY 12.11
INFORMATION DISPLAY AREA 12.12
DIAGNOSTIC MODE 12.14
INSTRUMENT CLUSTER PINOUTS 12.15
BRAKE SWITCH 12.15
IGNITION SWITCH 12.15
ADC / 4X4 / 2X4 / TURF SWITCH 12.16
OFF / RUN LH SWITCH 12.16
REVERSE OVERRIDE / MODE BUTTON 12.17
HEAD LAMP SWITCH 12.17
ELECTRONIC THROTTLE CONTROL (ETC) SWITCH 12.18
GEAR SELECTOR SWITCH 12.18
SPEED SENSOR 12.19
REAR DIFFERENTIAL SOLENOID (X2) 12.20
AWD / ADC COILS 12.21
RELAYS 12.22
CHASSIS / FAN / EFI RELAY 12.22
BUMPER LIGHTS / START SOLENOID / POWER STEERING RELAY 12.23
REAR DIFFERENTIAL SOLENOID RELAY (X2 MODELS) 12.23
FUSES 12.24
FUSE BOX LAYOUT 12.24
LIGHTS 12.25
HEADLIGHT / BUMPER LAMP ADJUSTMENT 12.25
HEADLIGHT / BUMPER LAMP REPLACEMENT 12.26
TAIL / BRAKE BULB REPLACEMENT 12.26
CHARGING SYSTEM 12.27
CHARGING SYSTEM DIAGRAM 12.27
VOLTAGE RECTIFIER / REGULATOR (600 WATT) 12.27
CURRENT DRAW - KEY OFF / BATTERY CHARGE TEST 12.27
STATOR / ALTERNATOR TESTS 12.27
STATOR / ALTERNATOR REMOVAL 12.28
STATOR / ALTERNATOR INSTALLATION 12.29
BATTERY SERVICE 12.30
BATTERY SPECIFICATIONS / GENERAL BATTERY INFORMATION 12.30
BATTERY REMOVAL / INSTALLATION / OFF SEASON STORAGE 12.30
BATTERY TESTING 12.30
OCV - OPEN CIRCUIT VOLTAGE TEST / LOAD TEST 12.31
BATTERY CONDUCTANCE ANALYZER 12.31
EXTREME USE 30 AH BATTERY 12.31
CHARGING PROCEDURE 12.31

9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

STARTER MOTOR 12.32
STARTER / STARTER LOCKOUT SYSTEM DIAGRAM 12.32
TROUBLESHOOTING 12.32
VOLTAGE DROP TESTING 12.32
STARTER MOTOR REMOVAL / REPLACEMENT 12.33
INSTRUMENT CLUSTER TROUBLESHOOTING 12.34
INSTRUMENT CLUSTER - KEY OFF / NO POWER 12.34
INSTRUMENT CLUSTER - KEY ON / NO POWER 12.35
INSTRUMENT CLUSTER - NO HIGH BEAM INDICATOR 12.36
INSTRUMENT CLUSTER - NO / INCORRECT FUEL LEVEL 12.37
ELECTRONIC POWER STEERING (EPS) 12.38
EPS OPERATION 12.38
EPS 8-WAY WIRE HARNESS CONNECTOR 12.38
PROPER EPS SYSTEM DIAGNOSING / EPS CIRCUIT 12.38
EPS TROUBLESHOOTING 12.39
ELECTRICAL BREAKOUT DIAGRAMS 12.40
BATTERY CHARGING CIRCUITS 12.40
CONSTANT POWER CIRCUITS 12.41
KEY-ON POWER CIRCUITS 12.42
KEY-ON POWER CIRCUITS (INT'L MODELS) 12.43
ENGINE START COMMAND AND GEAR SWITCH CIRCUITS 12.44
ENGINE START COMMAND AND GEAR SWITCH CIRCUITS (INT'L MODELS) . . . 12.45
CHASSIS POWER CIRCUITS 12.46
CHASSIS POWER CIRCUITS (INT'L MODELS) 12.47
ECM WAKE-UP COMMAND AND FUEL PUMP / FUEL LEVEL CIRCUITS 12.48
AWD / ADC / TURF AND GROUND SPEED SENSOR CIRCUITS 12.49
LIGHT CIRCUITS 12.50
LIGHT CIRCUITS (INT'L MODELS) 12.51
TURN SIGNALS / HAZARD LIGHTS (INT'L MODELS) 12.52
COOLING FAN AND ELECTRONIC POWER STEERING CIRCUITS 12.53
CONTROLLER AREA NETWORK (CAN) 12.54

9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

GENERAL INFORMATION

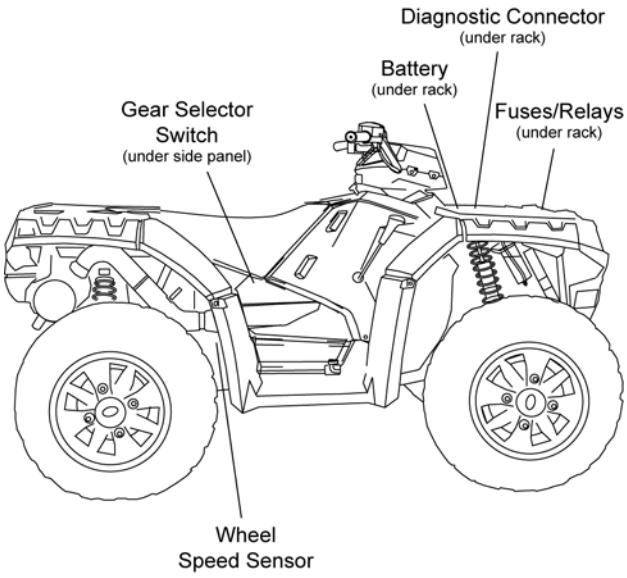
Special Tools

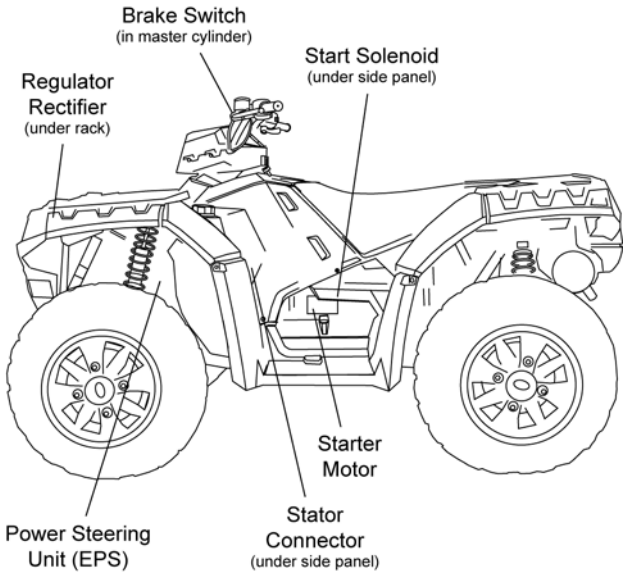
PART NUMBER	TOOL DESCRIPTION
PV-43568	Fluke™77 Digital Multimeter
PA-49466	Test Relay
PV-43526	Connector Test Kit

Electrical Service Notes

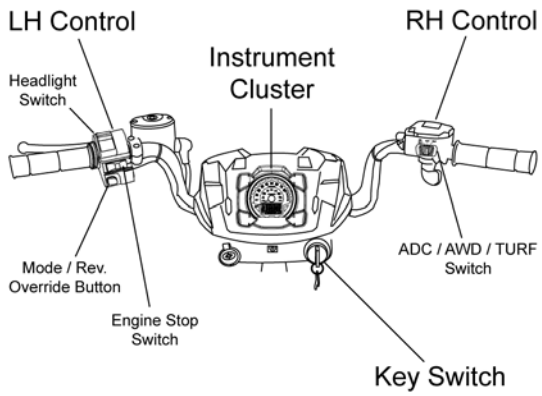
Keep the following notes in mind when diagnosing an electrical problem.

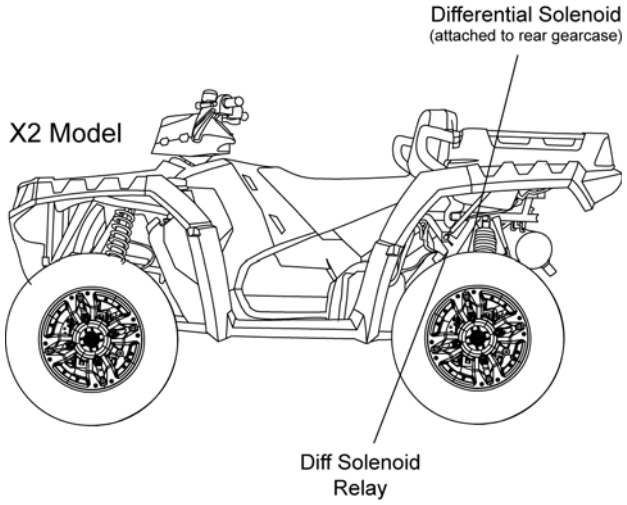
- Refer to wiring diagram for stator and electrical component resistance specifications.
- When measuring resistance of a component that has a low resistance value (under 10 Ohms), remember to subtract meter lead resistance from the reading. Connect the leads together and record the resistance. The resistance of the component is equal to tested value minus the lead resistance.
- Become familiar with the operation of your meter. Be sure leads are in the proper jack for the test being performed (i.e. 10A jack for current readings). Refer to the Owner's Manual included with your meter.
- Voltage, amperage, and resistance values included in this manual are obtained with a Fluke™ 77 Digital Multimeter **(PV-43568)**. This meter is acceptable for use when diagnosing electrical problems. Readings obtained with other meters may differ.
- Pay attention to the prefix on the multimeter reading (K, M, etc.) and the position of the decimal point.
- For resistance readings, isolate the component to be tested. Disconnect the wiring harness or power supply.





Component Locations



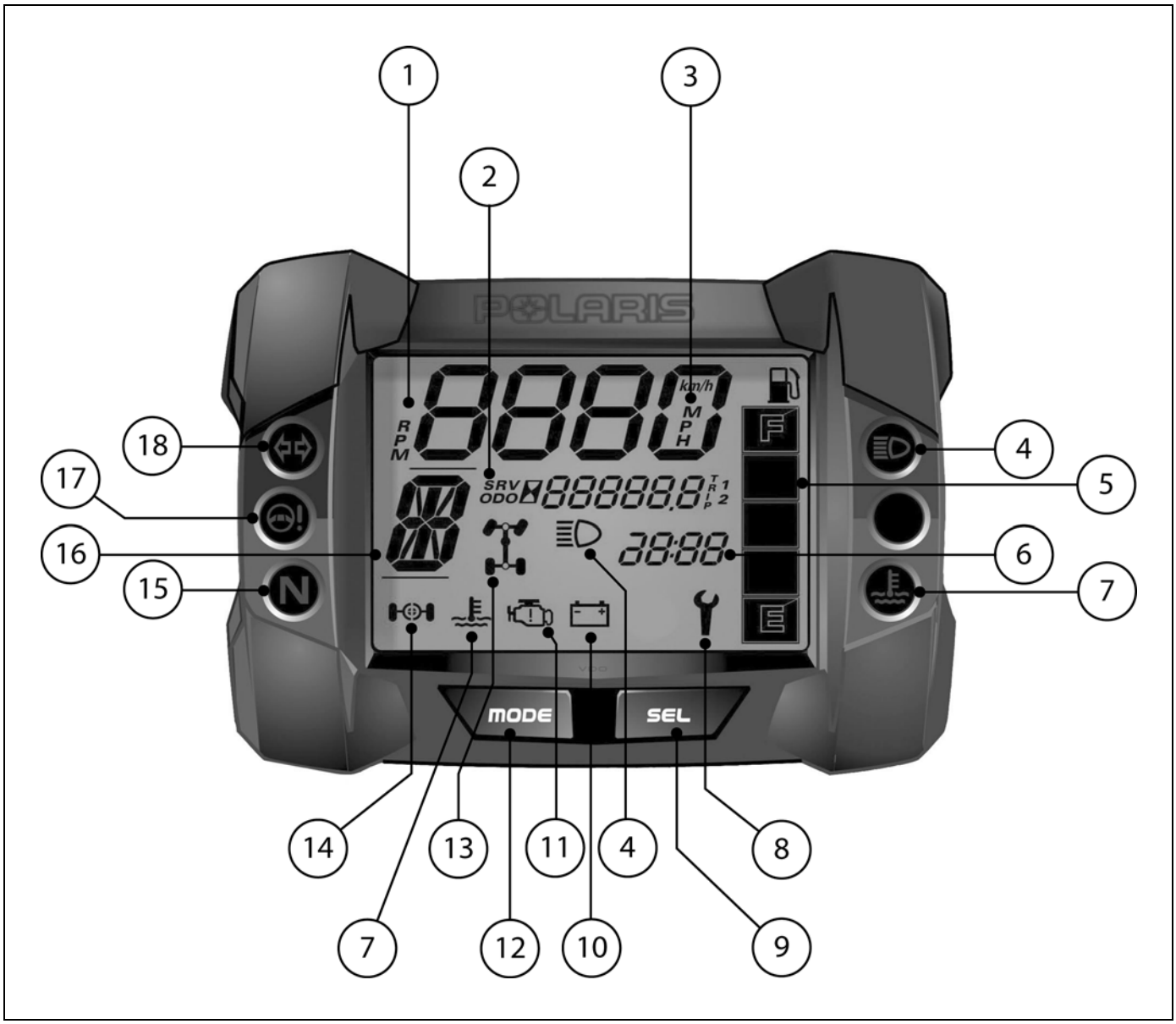


9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

INSTRUMENT CLUSTER (XP EPS MODELS)

Overview

The instrument cluster displays critical vehicle information to the user. Reference the following page for display functions and descriptions.



NOTE: Some features are not applicable to all models.

IMPORTANT: The use of a high pressure washer may damage the instrument cluster. Wash the ATV by hand or with a garden hose using mild soap. Certain products, including insect repellents and chemicals, will damage the instrument cluster lens. Do not use alcohol to clean the instrument cluster. Do not allow insect sprays to contact the lens. Immediately clean off any gasoline that splashes on the instrument cluster.

9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

Rider Information Display

The rider information display is located in the instrument cluster. All segments will light up for 1 second at start-up.

NOTE: If the instrument cluster fails to illuminate, a battery over-voltage may have occurred and the instrument cluster may have shut off to protect the electronic speedometer.

1. **RPM / Vehicle Speed Display** - LCD display of either engine RPM or vehicle speed in MPH or km/h.

2. **Information Area - Service / Odometer / Engine Hours / Trip Meter Display** - LCD display of the service hour interval, total vehicle miles or km., total engine hours, and two separate trip meters.

3. **MPH / km/h Display** - MPH is displayed when the instrument cluster is in the *Standard* mode. Km/h is displayed when the instrument cluster is in the *Metric* mode.

4. **High Beam Indicator** LED and LCD icon illuminate whenever the LH control headlamp switch is in the high beam position.

5. **Fuel Level Indicator** - LCD bar graph indicating current fuel level. All segments will flash when the last segment is cleared indicating a low fuel warning.

6. **Clock** - Displays current time in either 12-hour or 24-hour formats.

7. **Engine Temperature Indicator** - LED and LCD icons illuminate when the ECM determines the engine is overheating. The indicators will initially flash to indicate the engine is overheating. The indicators will stay lit and not flash if a severe overheating condition exists.

8. **Service Interval Indicator** - Preset at the factory at 50 hours and adjustable by the user, the icon will illuminate at engine start-up for 10 seconds when the engine hours meet the hour threshold indicating when maintenance should be performed.

9. **Select Button** - Press and release to toggle through the information area fields. The fields are: Odometer, Trip 1 / Trip 2, engine hours, and service interval. The information area will also display any current Diagnostic Trouble Codes (DTC) if applicable.

NOTE: Select button locked out when vehicle speed is above 15 MPH.

10. **Battery Voltage Indicator** - LCD icon is displayed when the battery voltage is either too low (less than 10V) or too high (greater than 16V) as determined by the ECM.

11. **Check Engine MIL** - Illuminated when the ECM has detected a Diagnostic Trouble Code in the engine management system. Icon will flash when DTC display mode is active.

12. **Mode Button** - Press and release to toggle between engine RPM or vehicle speed displays. The mode button is also used to change units, reset the trip meters, enter clock set mode, enter service interval update, toggle through DTCs, and display the clock with key out of ignition.

NOTE: The mode button is locked out when vehicle speed is above 15 MPH.

13. **AWD Indicator** - Illuminated when the RH control switch is in either *4x4* or *ADC 4x4* position.

14. **TURF Indicator** - Illuminated when the RH control switch is in the TURF position (X2 Models Only).

15. **Neutral Gear Indicator** - LED illuminated when gear selector is in the neutral (N) position.

16. **Gear Position Indicator -** Displays gear selector position.

H = High

L = Low

N = Neutral

R = Reverse

P = Park

-- = Error (shifter stuck between gears)

17. **Power Steering System MIL -** LED illuminates when a fault has occurred with the power steering system. The LED will illuminate when DTC display mode is active.

18. **Turn Signal / Hazard Lamp Indicator** - (International Models Only) LED illuminates whenever the LH, RH or hazard lamps are activated.

9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

Speed Information

The top section of the instrument cluster is dedicated to displaying either vehicle speed or engine RPM.

1. Select N or P gear position. Function will not work through REVERSE OVERRIDE button when reverse gear is selected.

2. Press and release the MODE button on the instrument cluster or press and hold the LH control REVERSE OVERRIDE button for more than 1/2 second to toggle between vehicle speed and engine RPM displays.

NOTE: Mode button on instrument cluster is locked out when vehicle speed is above 15 MPH.

Information Display Area

The center of the LCD is the information display area. Information displayed in this area includes: Odometer, Trip 1 / Trip 2, engine hours, service interval, engine Diagnostic Trouble Codes (DTCs), and power steering DTCs.

1. Press and release the SELECT button on the instrument cluster or press and release the LH control REVERSE OVERRIDE button to toggle between the information displays.

NOTE: DTC display modes can only be accessed using the SELECT button on the instrument cluster. Select button on instrument cluster is locked out when vehicle speed is above 15 MPH.

Odometer

Trip Meters 1 and 2

The trip meters record the miles traveled by the ATV on each trip. To reset a particular trip meter:

1. Toggle the SELECT button to either TRIP 1 or TRIP 2.

2. To reset to 0, push and hold the MODE button until the distance display changes to 0.

Engine Hours

9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

Engine hours are logged anytime the engine is running. Total hours can not be reset.

Programmed Service Interval

The initial factory service interval setting is 50 hours. Each time the engine is started, the engine hours are subtracted from the service interval hours. When the service interval reaches 0, the LCD wrench icon will illuminate for approximately 10 seconds each time the engine is started.

To change the hour setting or reset the function, follow these steps:

1. Toggle the SELECT button until SRV is displayed in the information area.
2. Press and hold the MODE button until the information display area begins to flash.
3. Toggle the SELECT button to increase the service interval hours in 5 hour increments to a maximum of 100 hours.
4. To turn off the service interval function, toggle the SELECT button until “OFF” is displayed.

Clock

The clock displays the time in a 12-hour or 24-hour format. Change between 12-hour and 24-hour formats by performing the following procedure:

1. Press and hold the MODE button until RPM is displayed.
2. Toggle the SELECT button until the odometer is displayed.
3. Press and hold the MODE button until the clock displays the new hour format.

To view the clock when the key is out of the ignition switch, press the MODE button. The current time will be displayed for approximately 10 seconds.

There are two methods for setting the clock.

Method 1

1. Toggle the SELECT button until engine hours is displayed.
2. Press and hold the MODE button until the clock begins to flash.
3. Press and release the SELECT button to change the hours.
4. Press and release the MODE button to move to the next position. The minutes are set in the same manner.
5. When the time is no longer flashing, the clock has been set.

9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

Method 2

1. With the ignition key in the OFF position, press and hold the MODE button.
2. While still pressing the MODE button, turn the ignition key to the ON position. Continue holding the MODE button until the time begins to flash.
3. Follow steps 3 - 5 in METHOD 1 to set the clock.

Units of Measurement

To change between Standard and Metric units of measurement, follow these steps:

1. Toggle the MODE button until the vehicle speed is displayed on the screen.
2. Toggle the SELECT button until the odometer is displayed in the information area.
3. Press and hold the MODE button until the units of measurement in the speedometer area change (MPH to km/h or km/h to MPH).
4. Release the button when the desired setting is achieved. All units including vehicle speed and odometer/ trip meters, will be set to the desired Standard or Metric units.

Diagnostic Mode

Use the following procedure to display diagnostic trouble codes logged in the ECM if the check engine MIL is illuminated on the instrument cluster.

1. Place the transmission in PARK.
2. Push and release the SELECT button to toggle through the LCD display until the check engine MIL icon is flashing.
3. When the check engine MIL icon is flashing, a set of two numbers will appear on the LCD.
4. The first number is located in the information area and can be 2 to 6 digits in length. This number equates to the suspected area of fault.

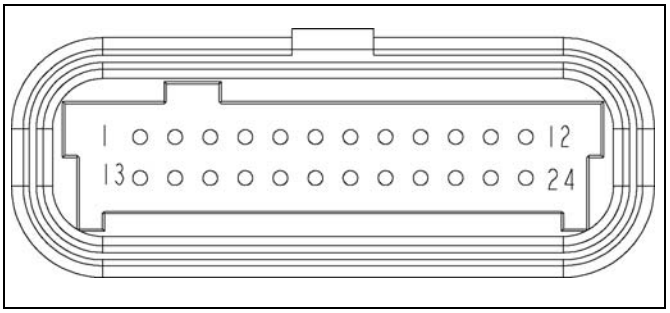
5. The second number will appear in the clock area and can 1 to 2 digits in length. This number equates to the fault mode.

6. Use the trouble code reference table in the EFI Chapter for a description of each code.
7. Press and hold the MODE button to cycle through all currently active codes.

NOTE: On vehicles equipped with power steering, the power steering MIL LED will illuminate and blink in place of the check engine MIL if there is a diagnostic problem with the power steering system.

© Copyright 2010 Polaris Sales Inc.

Instrument Cluster Pinouts



NOTE: Some functions not found on all models.

Instrument Cluster Pinouts

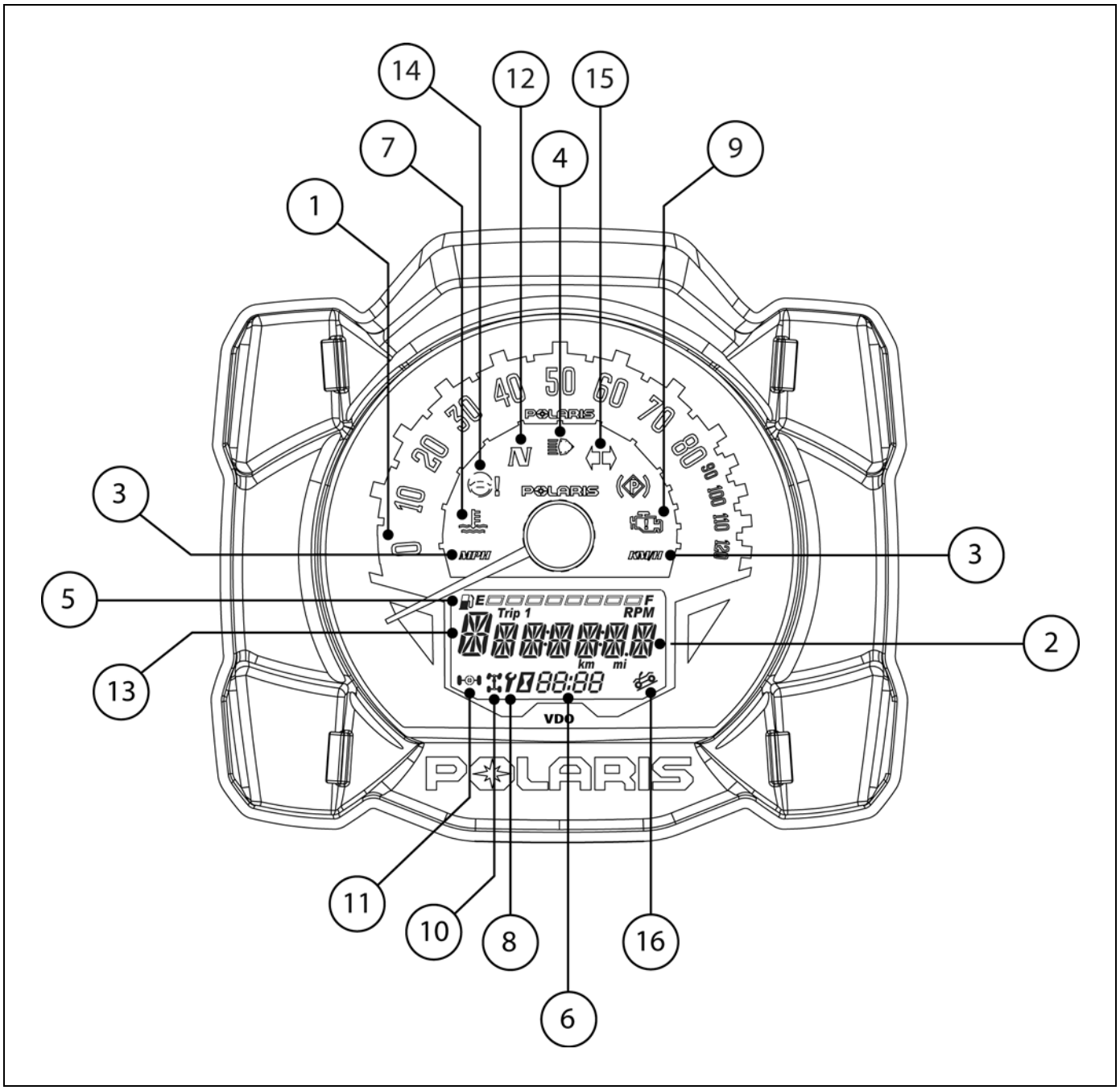
FUNCTION	PIN
Battery Voltage (Vdc)	1
Ground	2
Run / Stop Switch	3
CAN High	4
CAN Low	5
High Beam Input	20
Fuel Level Sensor	23
International Models Only	
Hazard Warning	10
Left Turn Signal	21
Right Turn Signal	22

9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

INSTRUMENT CLUSTER (XP / X2 / TOURING MODELS)

Overview

The instrument cluster displays critical vehicle information to the user. Reference the following page for display functions and descriptions.



NOTE: Some features are not applicable to all models.

IMPORTANT: The use of a high pressure washer may damage the instrument cluster. Wash the ATV by hand or with a garden hose using mild soap. Certain products, including insect repellents and chemicals, will damage the instrument cluster lens. Do not use alcohol to clean the instrument cluster. Do not allow insect sprays to contact the lens. Immediately clean off any gasoline that splashes on the instrument cluster.

9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

Rider Information Display

The rider information display is located in the instrument cluster. All segments will light up for 1 second at start-up.

NOTE: If the instrument cluster fails to illuminate, a battery over-voltage may have occurred and the instrument cluster may have shut off to protect the electronic speedometer.

The reverse override button on the LH control acts as the MODE button when pressed and released quickly. The transmission cannot be in reverse when using the override button as a MODE button.

1. **Vehicle Speed Display** - Analog display of vehicle speed in MPH or km/h.
2. **Information Display Area - Odometer / Trip Meter / Tachometer / Engine Hours / Service Info / Clock** - LCD display of the service hour interval, total vehicle miles or km., total engine hours, trip meters and engine RPM.
3. **MPH / KM/H Display** - MPH is displayed when the instrument cluster is in the *Standard* mode. KM/H is displayed when the instrument cluster is in the *Metric* mode.
4. **High Beam Indicator** LED icon illuminates whenever the LH control headlamp switch is in the high beam position.
5. **Fuel Level Indicator** - LCD bar graph indicating current fuel level. All segments will flash when the last segment is cleared indicating a low fuel warning.
6. **Clock** - Displays current time in either 12-hour or 24-hour formats.
7. **Engine Temperature Indicator** - LED icon illuminates when the ECM determines the engine is overheating. The indicators will initially flash to indicate the engine is overheating. The indicators will stay lit and not flash if a severe overheating condition exists.
8. **Service Interval Indicator** - Preset at the factory and adjustable by the user, a flashing wrench symbol alerts the operator that the preset service interval has been reached and maintenance should be performed. The wrench icon will flash for 10 seconds upon start-up once it reaches 0.
9. **Check Engine MIL** - Illuminated when the ECM has detected a Diagnostic Trouble Code in the engine management system.
10. **AWD Indicator** - Illuminated when the RH control switch is in either *4x4* or *ADC 4x4* position.
11. **TURF Indicator** - Illuminated when the RH control switch is in the *TURF* position (X2 Models Only).
12. **Neutral Gear Indicator** - LED icon illuminates when gear selector is in the neutral (N) position.
13. **Gear Position Indicator -** Displays gear selector position.

H = High

L = Low

N = Neutral

R = Reverse

P = Park

-- = Gear Signal Error (shifter stuck between gears)

14. **Power Steering System MIL -** LED icon illuminates when a fault has occurred with the power steering system. This indicator illuminates when the key is turned to the ON position and goes off when the engine is started.
15. **Turn Signal / Hazard Lamp Indicator** - LED icon illuminates whenever the LH, RH or hazard lamps are activated (International Models Only).
16. **Active Descent Control Indicator** - Illuminated when the RH control switch is in the *ADC 4x4* position and ADC is active.

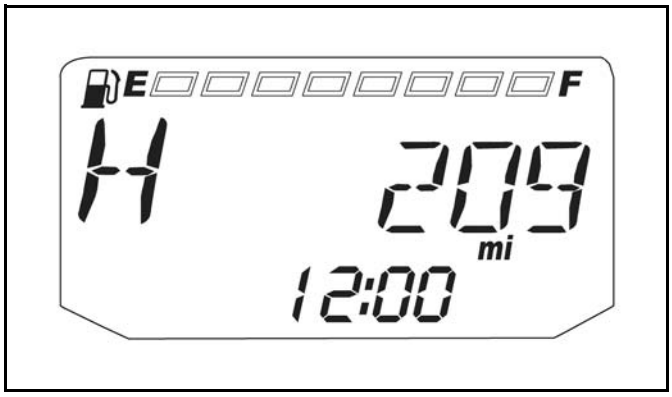
9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

Information Display Area

The LCD portion of the instrument cluster is the information display area. Information displayed in this area includes: odometer, trip meters, engine RPM, engine hours, service interval, clock, engine Diagnostic Trouble Codes (DTCs) and power steering DTCs.

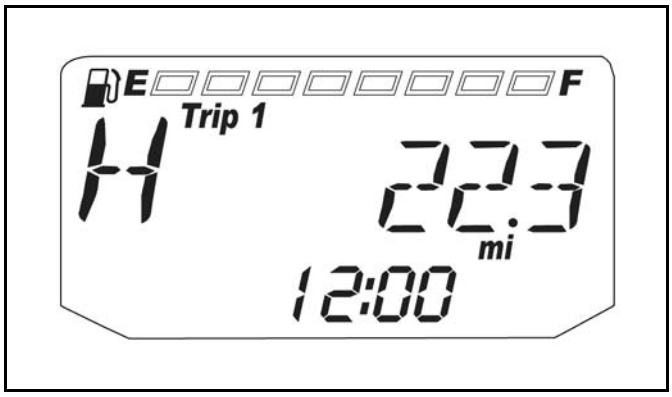
The reverse override button on the LH control acts as the MODE button when pressed and released quickly. The transmission cannot be in reverse when using the override button as a MODE button.

Odometer



The odometer records and displays the total distance traveled by the ATV. The odometer can not be reset.

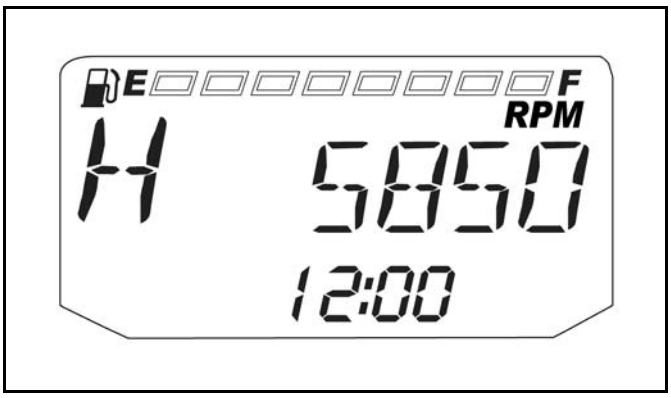
Trip Meters (Trip1 / Trip 2)



The trip meters records the miles traveled by the ATV on each trip. To reset the trip meters:

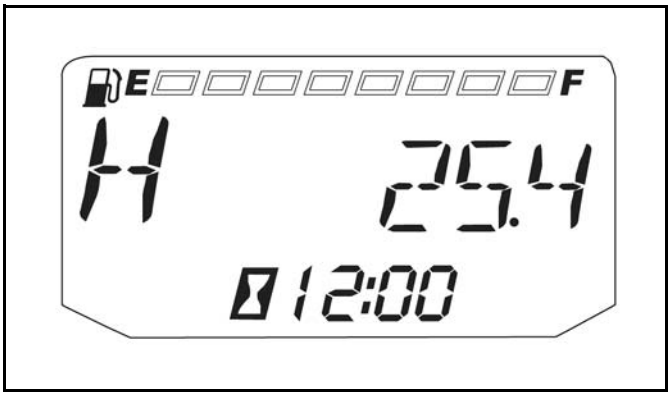
1. Toggle the MODE button to *Trip 1*.
2. To reset to 0, push and hold the MODE button until the distance display changes to 0.
3. Perform this same procedure to reset *Trip 2*.

Tachometer (RPM)



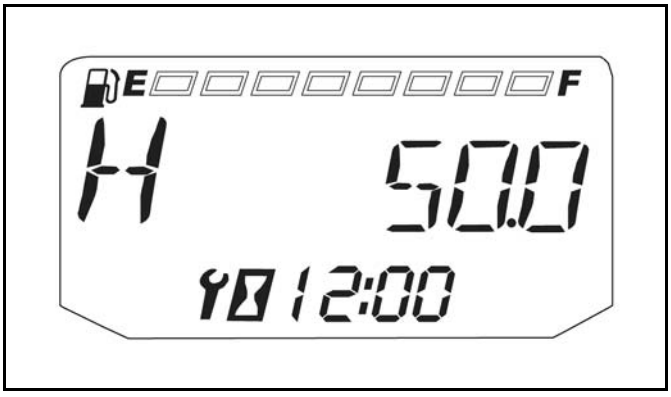
Engine RPM can be displayed digitally.

Engine Hours



Engine hours are logged anytime the engine is running. Total hours can not be reset.

Programmed Service Interval



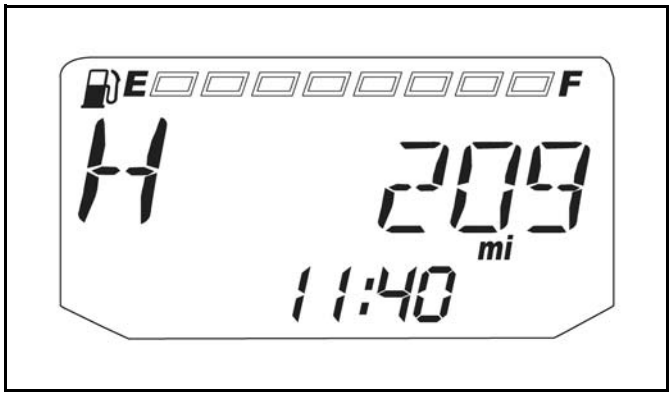
The initial factory service interval setting is 50 hours. Each time the engine is started, the engine hours are subtracted from the service interval hours. When the service interval reaches 0, the LCD wrench icon will flash for approximately 10 seconds each time the key is turned ON.

9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

To change the hour setting or reset the function, follow these steps:

1. Toggle the MODE button until the wrench icon is displayed in the information area.
2. Press and hold the MODE button until the information display area begins to flash.
3. Toggle the MODE button to increase the service interval hours in 5 hour increments to a maximum of 100 hours.
4. To turn off the service interval function, toggle the MODE button until “OFF” is displayed.

Clock



The clock displays the time in a 12-hour or 24-hour format. Refer to “Units of Measurement” to change the format (Standard 12-hour / Metric-24 hour). To set the clock, follow these steps:

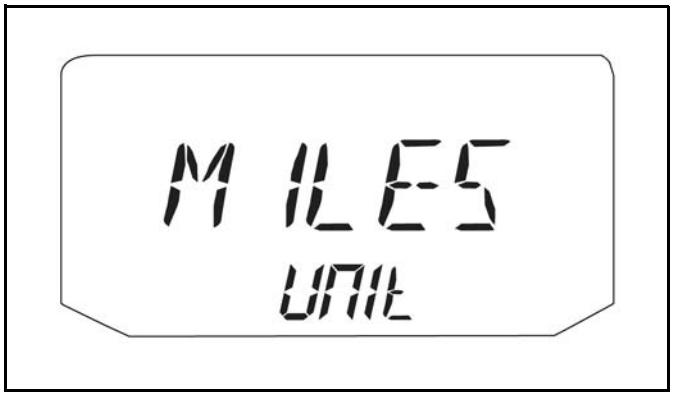
1. Toggle the MODE button until the odometer is displayed.
2. Press and hold the MODE button until the hour segment flashes. Release the button
3. With the segment flashing, tap the MODE button to advance to the desired setting.
4. Press and hold the MODE button until the next segment flashes. Release the button.
5. Repeat steps 3-4 twice to set the 10 minute and 1 minute segments. After completing the 1-minute segment, step 4 will save the new settings and exit the clock mode.

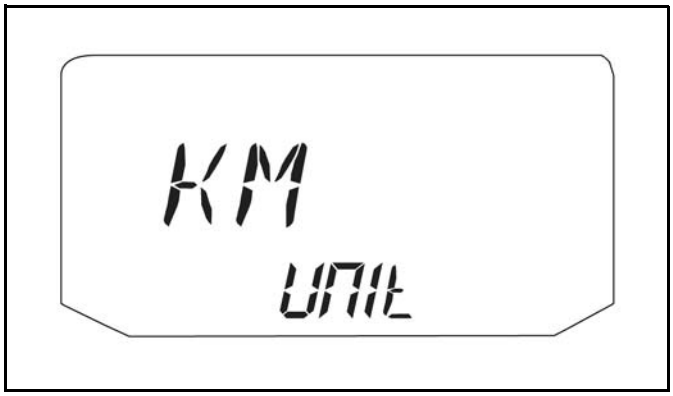
Units of Measurement

	Standard Display	Metric Display
Distance	Miles (MPH)	Kilometers (KM/H)
Time	12-Hour Clock	24-Hour Clock

To change between Standard and Metric units of measurement, follow these steps:

1. Turn the key to the OFF position.
2. Press and hold the MODE button while turning the key to the ON position.
3. When the display flashes the distance setting, tap the MODE button to advance to the desired setting.





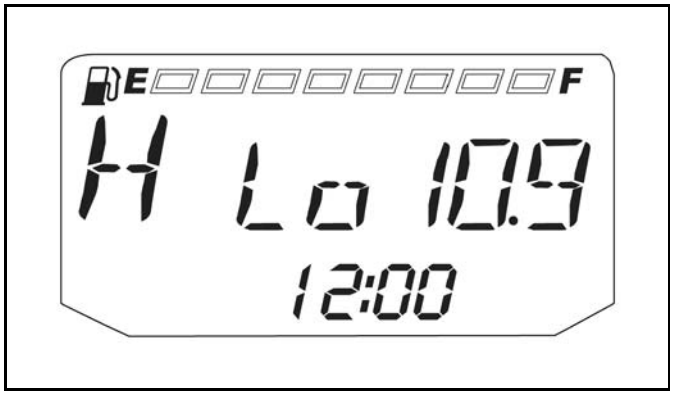
4. Press and hold the MODE button to save the setting and advance to the next display option.
5. Repeat the procedure to change remaining display settings.

9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

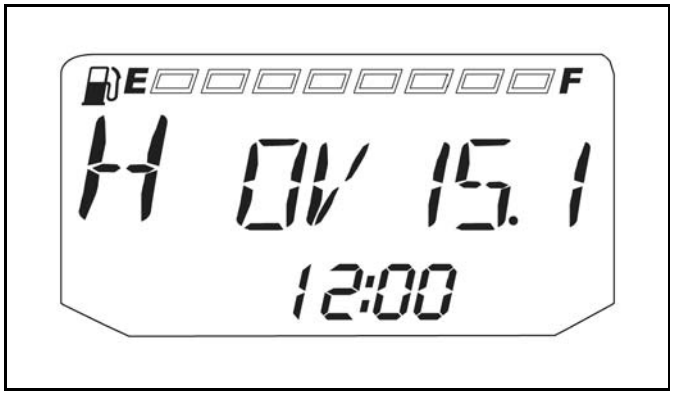
Under / Over Voltage

This warning usually indicates that the vehicle is operating at an RPM too low to keep the battery charged. It may also occur when the engine is at idle and a high electrical load is applied (lights, cooling fan or other accessories).

If battery voltage drops below 11 volts, a warning screen will display “Lo” and provide the present battery voltage. If voltage drops below 8.5 volts, LCD backlighting and icons will turn off.



If battery voltage rises above 15 volts, a warning screen will display “OV” and provide the present battery voltage. If voltage rises above 16.5 volts, LCD backlighting and icons will turn off.



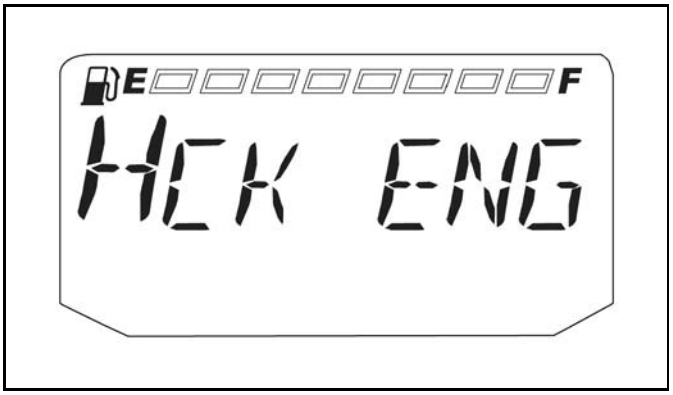
Diagnostic Mode

The diagnostic mode is accessible only when the check engine MIL has been activated.

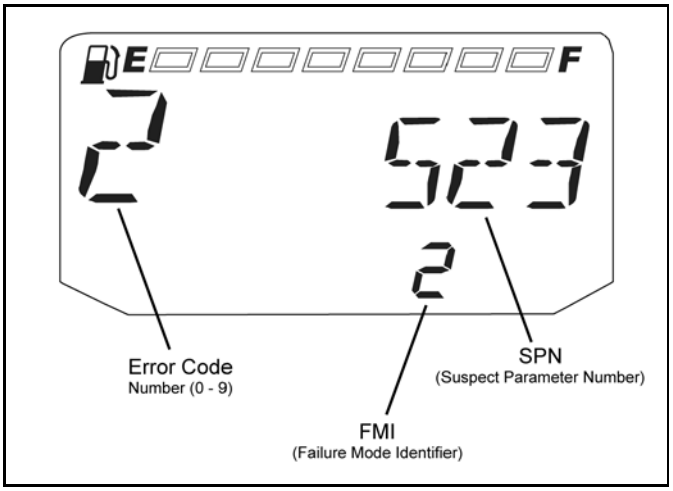
NOTE: If there is a diagnostic problem with the power steering system, the power steering MIL will illuminate and blink in place of the check engine MIL.

Use the following procedure to display diagnostic trouble codes that were activated during current ignition cycle causing the MIL to illuminate. Diagnostic trouble codes will remain stored in the gauge (even if MIL turns off) until the key is turned off.

1. If the trouble code(s) are not displayed, use the MODE button to toggle until “CK ENG” displays on the information display area.



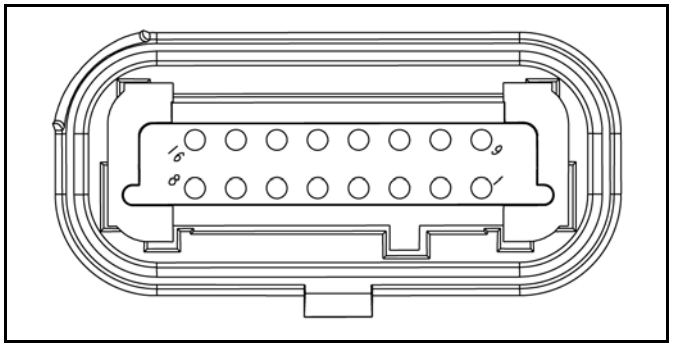
2. Press and hold the MODE button to enter the diagnostics code menu.
3. A set of three numbers will appear in the information display area.
   - The first number (located far left) can range from 0 to 9. This number represents the total number of trouble code present (example: 2 means there are 3 codes present).
   - The second number (located top right) can be 2 to 6 digits in length. This number equates to the suspected area of fault (SPN).
   - The third number (located bottom right) can be 1 to 2 digits in length. This number equates to the fault mode (FMI).



4. Use the trouble code reference table in the EFI Chapter for a description of each code.
5. If more than one code exists, press the MODE button to advance to the next trouble code.
6. To exit the diagnostic mode, press and hold the MODE button or turn the ignition key OFF once the codes are recorded.

© Copyright 2010 Polaris Sales Inc.

Instrument Cluster Pinouts



FUNCTION	PIN
CAN High	1
CAN Low	2
Switched Power (Vdc)	3
Constant Power (Vdc)	4
Ground	5
High Beam Input	8
Fuel Level Sensor	11
International Models Only	
Turn Signal Input, LH	6
Turn Signal Input, RH	7

BRAKE SWITCH

Function Test

Applying the brakes closes a switch to activate the brake lamps. Use a multimeter to test for continuity when the brakes are applied.

Brake Switch Test

	Pin 1	Pin 2
Brakes Not Applied		
Brakes Applied		

Replace the brake switch if function does not pass test.

IGNITION SWITCH

Function Test

Use a multimeter to test for continuity between the 3 sets of ignition switch outputs (OFF / ON / START). If any of the tests fail, replace ignition switch assembly.

Ignition Switch Test

	A	B	C	D	E	F
OFF					●	●
ON			●	●		
	●					●
START	●	●	●	●		

Turn the ignition key to ON. There should be continuity between pins C and D; A and F.

Turn the ignition key to START. There should be continuity between pins A and B; C and D.

Function Test (INT'L)

Use a multimeter to test for continuity between the 4 sets of ignition switch outputs (OFF / ON, LIGHTS / ON / START). If any of the tests fail, replace ignition switch assembly.

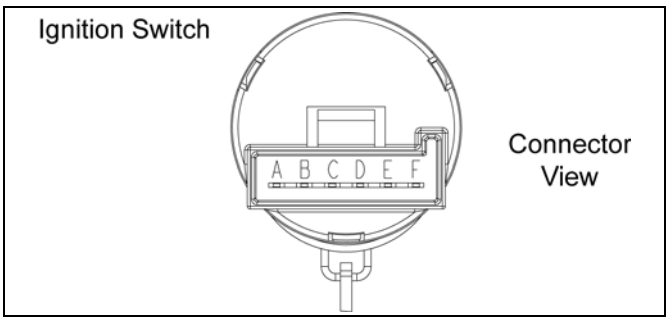
Ignition Switch Test (INT'L)

	A	B	C	D	E	F
OFF					●	●
ON, LIGHTS	●				●	●
			●	●		
ON			●	●	●	●
START	●	●	●	●	●	●

Turn the ignition key to ON, LIGHTS. There should be continuity between pins A, E and F; C and D.

Turn the ignition key to ON. There should be continuity between pins C and D; E and F.

Turn the ignition key to START. There should be continuity between pins A and B; C and D; E and F.



9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

ADC / 4X4 / 2X4 / TURF SWITCH

Function Test

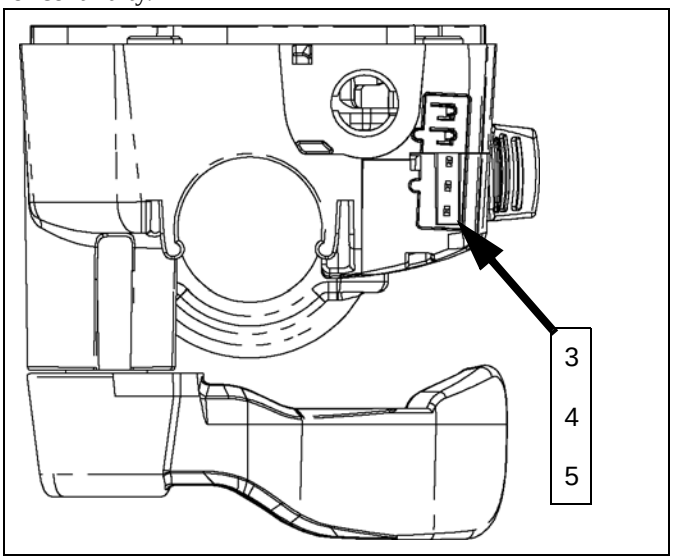
Use a multimeter to test for continuity between the two switch outputs (ADC/AWD). If testing an X2 model, test for continuity between the three switch outputs (ADC/AWD/TURF).

NOTE: Selecting 2x4 drive mode does not complete any circuits. All circuits should be OL when 2x4 is selected.

ADC / 4x4 / 2x4 / TURF Switch Test

	3	4	5
ADC 4x4	●	●	●
AWD 4x4	●	●	
2x4			
TURF	●		●

Move the drive selector switch to each drive mode, and then test for continuity.



If any of the tests fail, replace the RH throttle / switch assembly.

OFF / RUN LH SWITCH

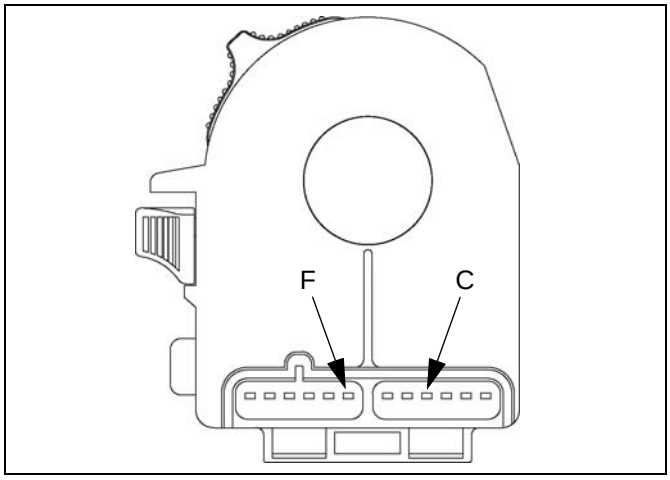
Function Test

Use a multimeter to test for continuity when the LH switch is moved to the RUN position. If the test fails, replace the LH control assembly.

Move the switch to the RUN position and test.

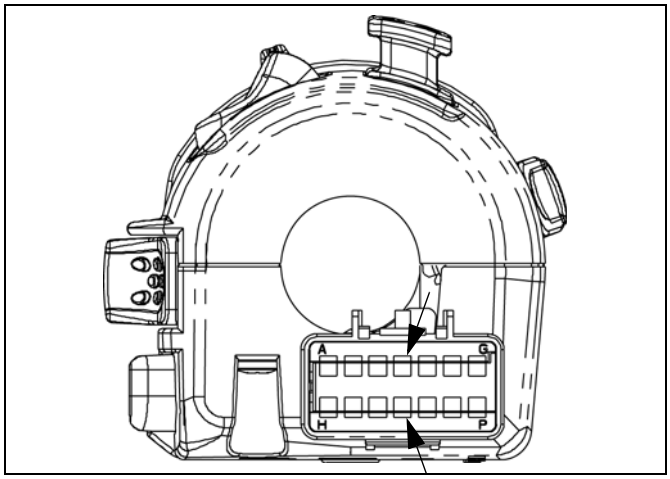
Off / Run Switch Test

	F (Left Connector)	C (Right Connector)
OFF		
RUN	●	●



Off / Run Switch Test (INT'L)

	RD / BK	OR
OFF		
RUN	●	●



9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

REVERSE OVERRIDE / MODE BUTTON

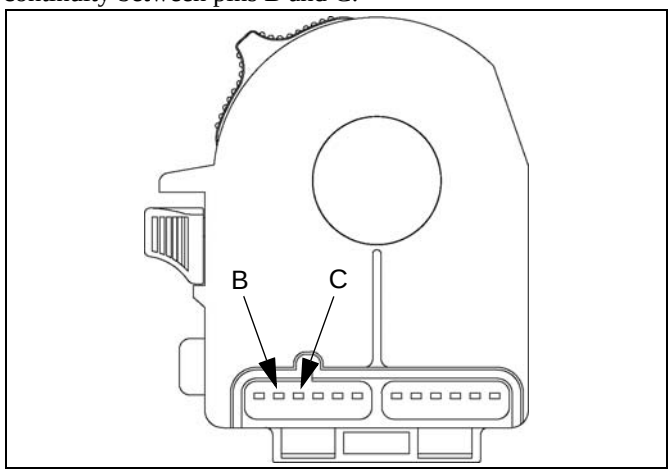
Function Test

Use a multimeter to test for continuity when pressing the Reverse Override / Mode button. If the test fails, replace the LH control assembly.

Reverse Override / Mode Button Test

	B	C
FREE		
PUSH	●	●

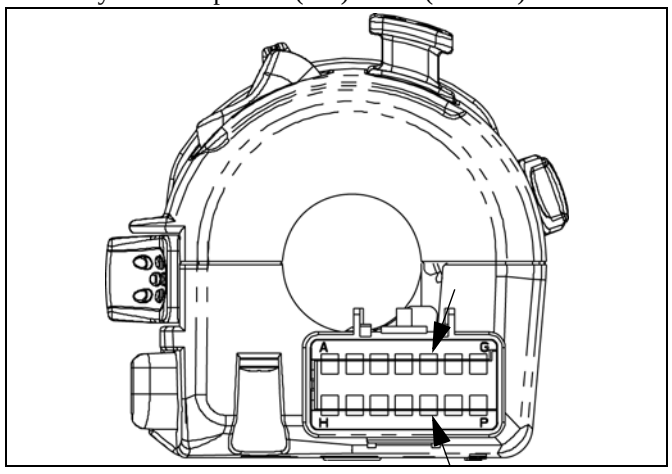
Push the Reverse Override / Mode button. There should be continuity between pins B and C.



Reverse Override / Mode Button Test (INT'L)

	BN	GY / OG
FREE		
PUSH	●	●

Push the Reverse Override / Mode button. There should be continuity between pins M (BN) and E (GY/OG).



HEAD LAMP SWITCH

Function Test

Use a multimeter to test for continuity between the head lamp outputs in the LH control assembly. If any of the tests fail, replace the LH control assembly.

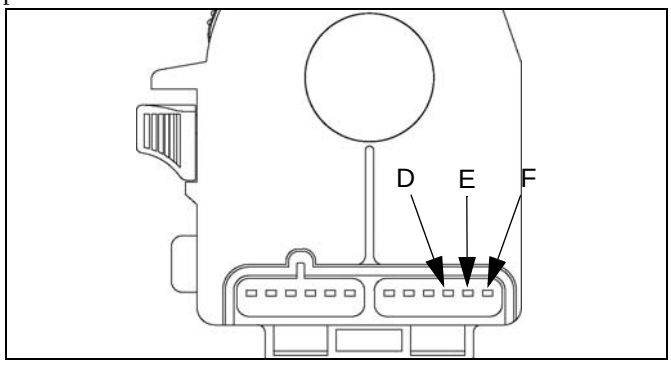
Headlamp Switch Test

	D	E	F
OFF			
LOW	●		●
HIGH	●	●	

There should be no continuity when the switch OFF.

Move the switch to LOW. There should be continuity between pins D and F.

Move the switch to HIGH. There should be continuity between pins D and E.

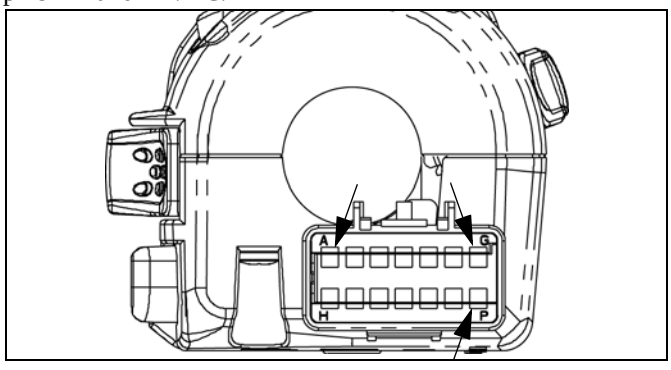


Dimmer Switch Test (INT'L)

	YE	YE / DG	DG
LOW		●	●
HIGH	●	●	

Move the switch to LOW. There should be continuity between pins YE/DG and DG.

Move the switch to HIGH. There should be continuity between pins YE and YE/DG.



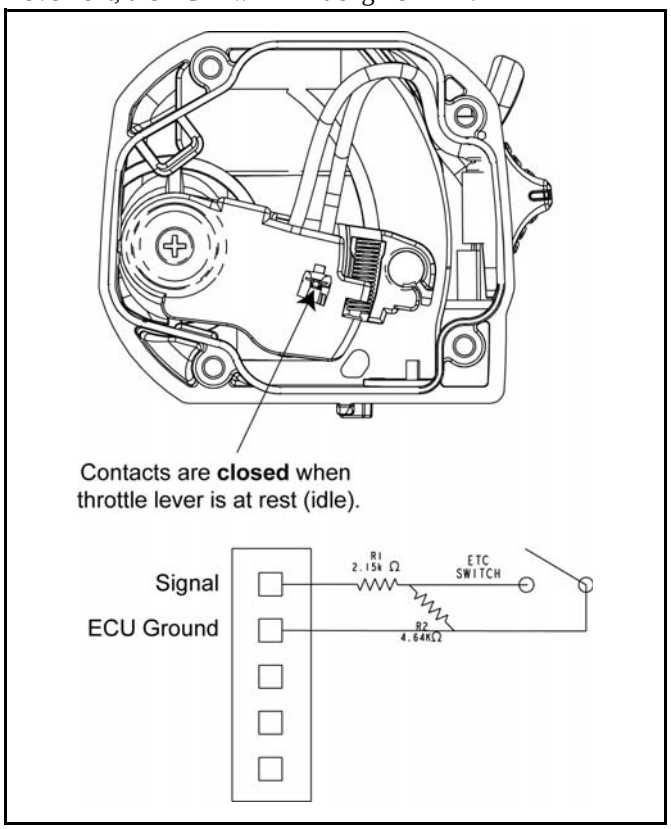
9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

ELECTRONIC THROTTLE CONTROL (ETC) SWITCH

Electronic Throttle Control (ETC) Switch

The Electronic Throttle Control (ETC) switch is designed to close during throttle movement in the event the throttle cable sticks or breaks.

When the throttle lever is at idle position, the ETC switch contacts should be closed (touching). When the throttle lever is moved the contacts will open and allow normal operation. If the contacts remain closed or become closed during throttle movement, the ECM will limit engine RPM.



IMPORTANT: The throttle cable must have the proper amount of free-play adjustment. Refer to Chapter 2 "Throttle Cable Adjustment" procedure.

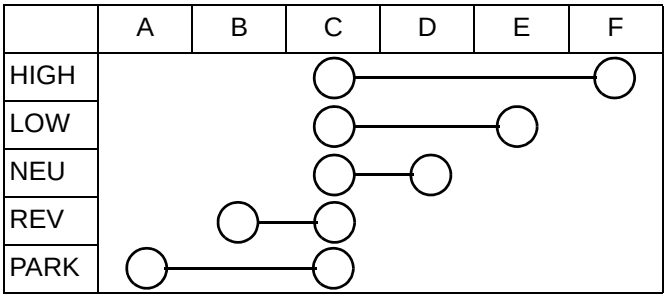
ETC Switch - Contact Positions	
Throttle Lever at Rest (idle)	ETC is CLOSED. Pins 1 and 2 Ω = 2.15k
Normal Operation (throttle open or above idle)	ETC is OPEN. Pins 1 and 2 Ω = 6.76k
Throttle Cable Stuck	ETC is CLOSED Pins 1 and 2 Ω = 2.15k

GEAR SELECTOR SWITCH

Selector Switch Function Test

1. Locate the gear selector switch on the transmission. Remove the wiring harness connector and insert the multimeter probes into the switch.
2. Move the gear selector handle to each of the 5 drive positions (HIGH, LOW, NEUTRAL, REV, or PARK).
3. Test for continuity between the switch contacts and connector leads. Replace the switch if no continuity or high resistance is found in any of the gear positions.

Gear Selector Switch Testing



Resistor Module Function Test

The resistor module relays a different resistance reading to the ECM depending on which gear is selected by the operator. If the module fails, the ECM will not be able to determine what gear the transmission is in.

NOTE: Reference Chapter 3: EFI for pin locations.

1. Disconnect the ECM harness connector from the ECM. Locate pins 8 (WHITE) and 33 (VIOLET).
2. Set the multimeter to register OHMS (resistance). Insert the RED probe into pin 8 and the BLACK probe into pin 33.
3. Reference the Resistance Table for specifications. If any of the tests fail, replace the resistor module.

Module Resistance +/- 5%

Gear Position	OHMS Ω
HIGH	620
LOW	300
NEUTRAL	160
REVERSE	75
PARK	24

9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

SPEED SENSOR

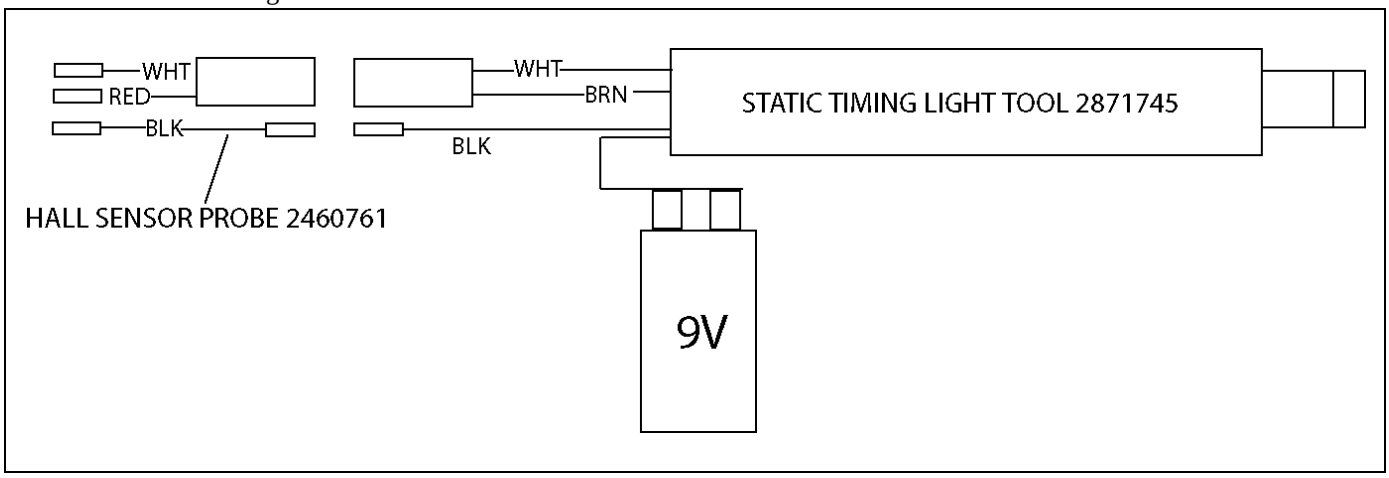
Vehicle Speed Sensor

The vehicle speed sensor is mated to the transmission housing and reads the speed of the transmission output gear.

Battery voltage is supplied to the sensor on the ORANGE circuit and is energized when the OFF/RUN and ignition switches are in the RUN and ON positions.

To test the circuit:

1. Turn the ignition key to the “ON” position and move the OFF/RUN switch to “RUN”.
2. Verify there is battery voltage present on the ORANGE circuit. If voltage is not found, inspect the ORANGE splices / circuits, LH control assembly, and ignition switch.
3. If voltage is found, test the BROWN ground circuit. Verify there is continuity between the circuit and chassis ground.
4. If all circuits function, remove the speed sensor from the transmission. Verify the sensor is not damaged.
5. Test the speed sensor using the following tools:
   - Hall Sensor Probe: PN 2460761
   - Static Timing Light Tool: PN 2871745
6. Connect the tools together as shown below.



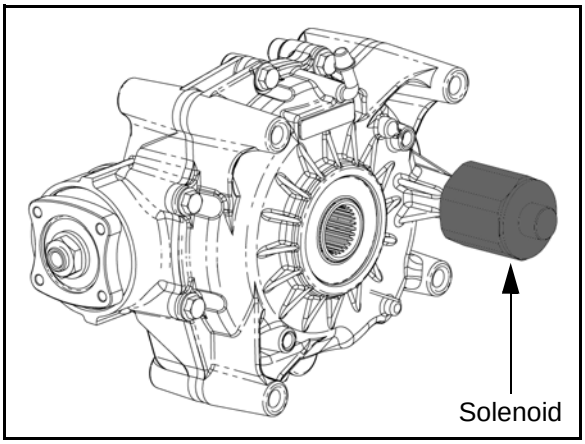
7. Insert the sensor probe’s 3 terminals into the speed sensor as follows:
   - WHITE wire into pin C.
   - BLACK wire into pin B.
   - RED wire into pin A.
8. Verify a good 9V battery is connected to the timing light tool.
9. Pass the blade of a screwdriver back and forth across the sensor tip. The timing light tool LED should illuminate each time the blade passes the sensor face.
10. If the test fails, replace the speed sensor.

© Copyright 2010 Polaris Sales Inc.

REAR DIFFERENTIAL SOLENOID (X2)

Operation Overview

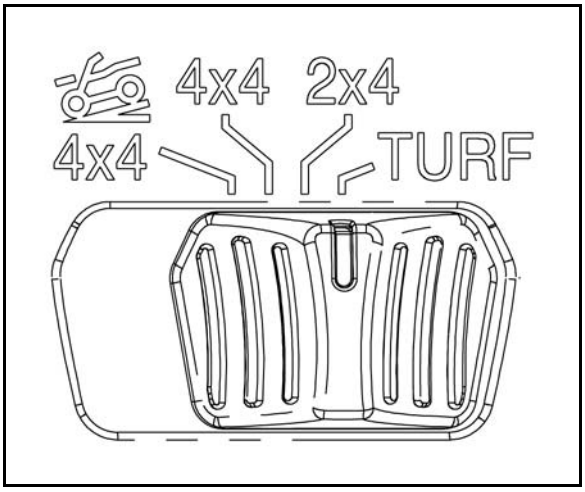
The differential solenoid is located on the rear gear case. Refer to Chapter 8 “REAR DIFFERENTIAL GEARCASE (X2)” for a mechanical operation overview.



Differential Solenoid Circuit Operation

The Rear Diff Solenoid Relay is located on the frame under the rear cargo box.

When the RH switch is pushed to activate the “TURF” mode, a signal is provided to the ECM from the switch to power the Rear Diff Solenoid Relay.



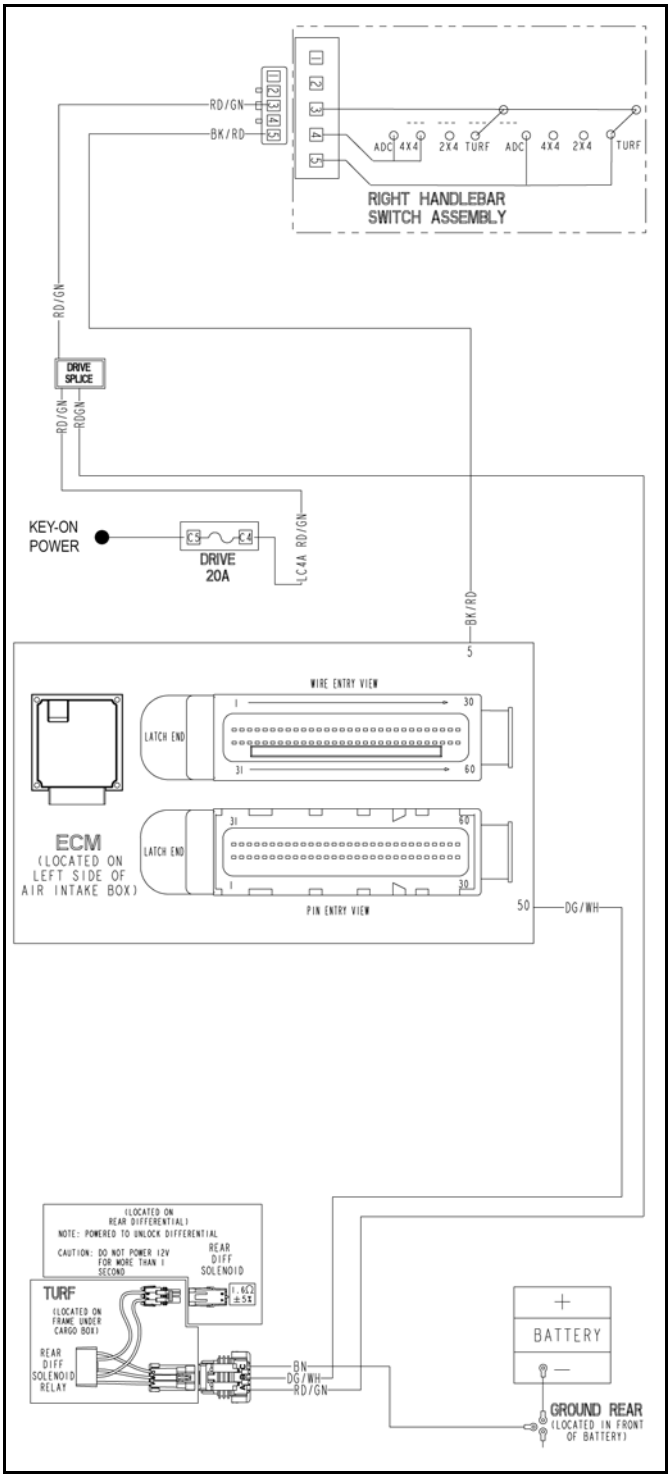
Depending on engine speed, wheel speed and gear position criteria, the ECM energizes the Rear Diff Solenoid Relay allowing it to enable the differential solenoid.

CAUTION

If testing the differential solenoid directly, do not power the solenoid with 12 Volts for more than 1 second, or damage may occur to solenoid.

If the rear differential fails to switch from operational modes:

- Check the solenoid and relay connectors. Look for loose wires or bad connections.
- Check for power from the relay connector, to ensure the solenoid has power to be activated.
- Check the RH switch wires for loose connections.
- Remove the solenoid from the rear differential and ensure the solenoid plunger is actuating.



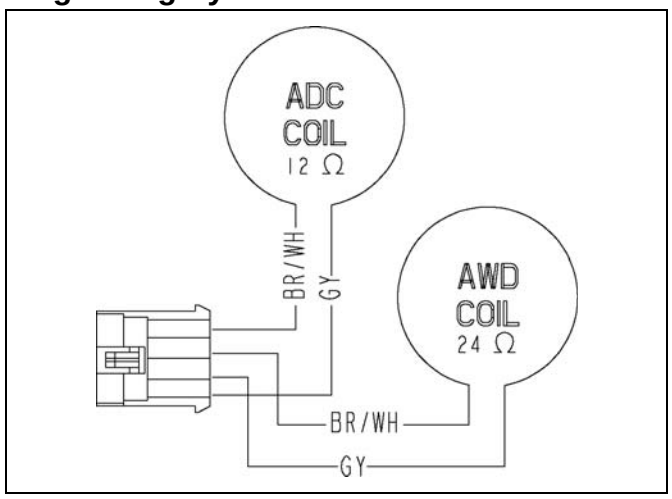
9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

AWD / ADC COILS

Operation Overview

- Battery voltage is always present at the AWD and ADC coils when the CHASSIS relay is active.
- AWD and ADC coil voltage is protected by the 20A DRIVE fuse.
- Battery voltage is always present at the ADC / 4x4 / 2x4 RH switch assembly whenever the CHASSIS relay is active. The circuit is also protected by the 20A DRIVE fuse.
- The ECM controls all ADC and AWD functions.

Diagnosing System Failures

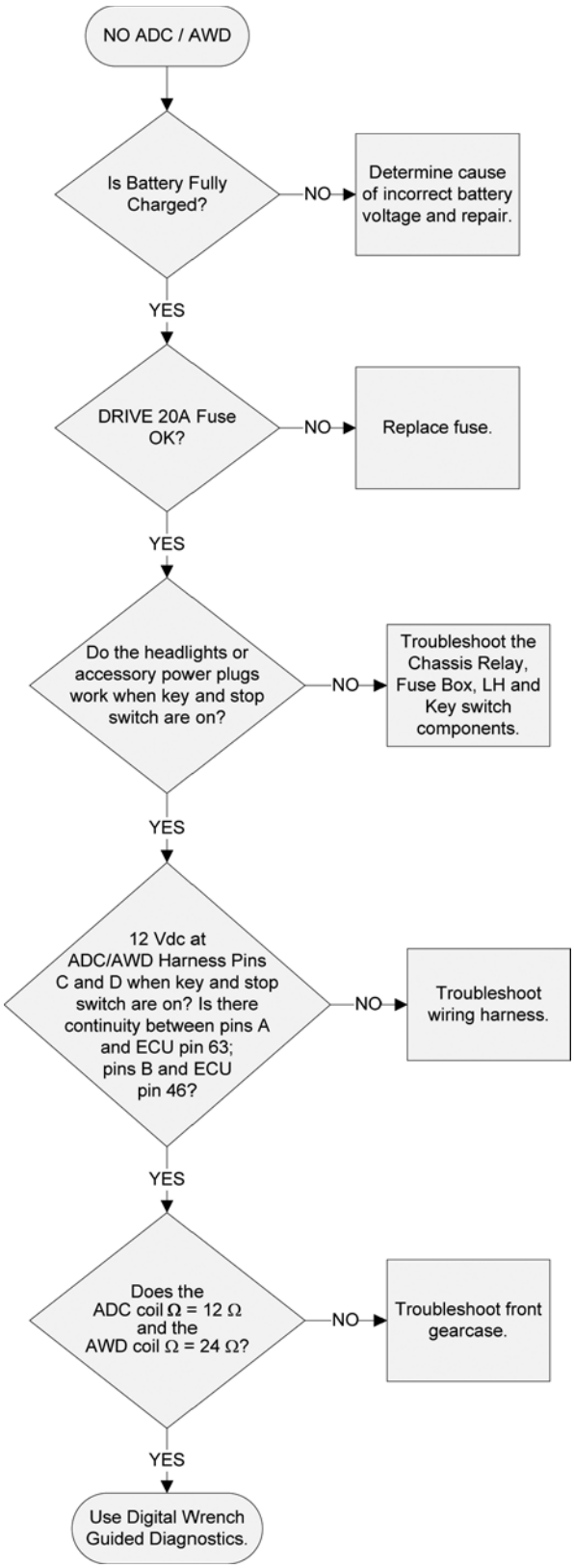


- Verify the ADC/AWD switch is functional and that a minimum of 11 volts is present at the hub coil connection.
- Verify the ADC/AWD hub coil is functional. Test the AWD hub coil using a multimeter.
- Verify the wiring harness, wiring, connectors, connector pins and grounds are undamaged, clean and connected properly.
- Verify continuity of wire connections with a known good volt/ohm meter.
- Verify the coil wires are not connected or shorted to ground.

IMPORTANT: Verify all wires and wiring connections have been tested properly with a known good volt/ohm meter before suspecting a component failure. 80% of all electrical issues are caused by bad connections and/or grounds.

AWD / ADC Function Tests

The following diagnostic test can be performed before using Digital Wrench. Troubleshooting functions not listed here can be found using Digital Wrench Guided Diagnostics.

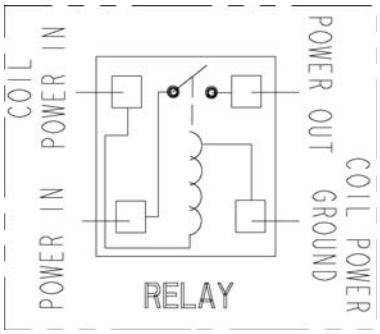

NO ADC / AWD
Is Battery Fully Charged?
NO
Determine cause of incorrect battery voltage and repair.
YES
DRIVE 20A Fuse OK?
NO
Replace fuse.
YES
Do the headlights or accessory power plugs work when key and stop switch are on?
NO
Troubleshoot the Chassis Relay, Fuse Box, LH and Key switch components.
YES
12 Vdc at ADC/AWD Harness Pins C and D when key and stop switch are on? Is there continuity between pins A and ECU pin 63; pins B and ECU pin 46?
NO
Troubleshoot wiring harness.
YES
Does the ADC coil Ω = 12 Ω and the AWD coil Ω = 24 Ω?
NO
Troubleshoot front gearcase.
YES
Use Digital Wrench Guided Diagnostics.

9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

RELAYS

Relay Overview

Each relay leg, or corner, performs the same function.



Chassis Relay

The chassis relay provides power to the following systems:

- Head Lights / Tail Lights / Brake Light
- AWD Coil / ADC Coil / RH Drive Switch
- Accessory Power Points

Chassis Relay

Color	Function
RD	Fuse link-protected 12 Vdc battery voltage.
DB / RD	ECM control circuit for relay coil.
ORG	LH RUN switch supplied 12 Vdc battery voltage to relay coil.
WHT	12 Vdc Bus bar for: -Lights 20A Fuse -Drive 20A Fuse -Accessory 20A Fuse

Fan Relay

The fan relay provides power to the following system:

- Fan Motor

Fan Relay

Color	Function
RD / WHT	10A Circuit breaker-protected 12 Vdc battery voltage.
ORG / YEL	ECM control circuit for relay coil.
RD / WHT	Constant 12 Vdc battery voltage to relay coil.
ORG / BLK	Fan motor power 12 Vdc.

EFI Relay

The EFI relay provides power to the following system:

- Ignition Coil Power
- Fuel Pump Power
- Fuel Injector Power

EFI RELAY

Color	Function
RD / GRN	20A fuse-protected 12 Vdc battery voltage.
GRN / YEL	Relay coil ground from ECM.
ORG	LH RUN switch supplied 12 Vdc battery voltage to relay coil.
RD / BLU	12 Vdc power splice for: -Ignition coil pack -Fuel Pump -Fuel Injectors

9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

Bumper Lights Relay

The bumper lights relay provides power to the following system:

- Front Bumper Head Lights

Bumper Lights Relay

Color	Function
RD / BRN	20A fuse-protected 12 Vdc battery voltage.
BRN	Ground for relay coil.
DG	High / Low LH control 12 Vdc battery voltage to relay coil.
DG	LH / RH front bumper lights power.

Start Solenoid Relay

The start solenoid relay provides power to the following system:

- Starter Motor Solenoid

Start Solenoid Relay

Color	Function
RD / WHT	10A circuit breaker-protected 12 Vdc battery voltage.
BRN / WHT	ECM control for relay coil.
WHT / RD	Starter solenoid power.
BLU / YEL	Key-switched (START) relay coil power 12 Vdc battery voltage.

Power Steering Relay (EPS Models)

NOTE: The power steering relay is not located inside the fuse box.

The power steering relay provides power to the following system:

- Power Steering Drive Motor

Power Steering Relay

Color	Function
ORG (85) or (1)	LH RUN switch supplied 12 Vdc battery voltage to relay coil.
BRN	Relay coil ground.
ORG (87) or (5)	Power steering 12 Vdc battery power.
RD	30A fuse-protected 12 Vdc battery voltage.

Rear Differential Solenoid Relay (X2 Models)

NOTE: The rear diff solenoid relay is not located inside the fuse box.

The rear differential solenoid relay provides power to the following system:

- Rear Differential Solenoid

Rear Differential Solenoid Relay

Color	Function
RD (2-pin)	Relay-switched voltage to rear diff solenoid.
BLU (2-pin)	Relay-switched ground for rear diff solenoid.
RD (3-pin)	Key-switched 12 Vdc battery power.
GRN (3-pin)	ECM relay control circuit for relay coil.
BRN (3-pin)	Ground for relay coil.

9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

FUSES

Protected Circuits

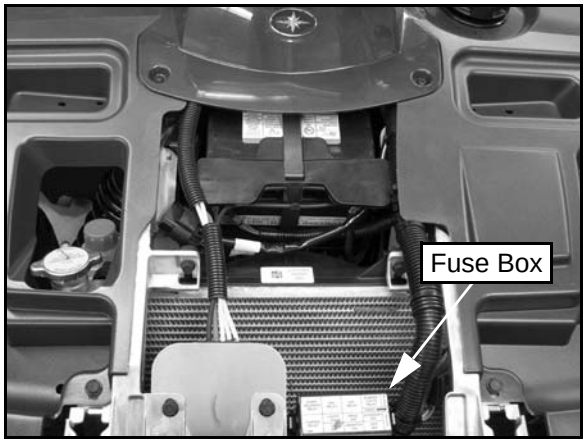
Fuse Table

Fuse	Protected Circuits
10A Circuit Breaker **Not in Fuse Box**	Fan Motor Starter Solenoid
20A EFI	EFI Relay-controlled circuits: -Ignition coil pack -Fuel Pump -Fuel Injectors
10A Unswitched Power	ECM Fan Relay Driver Ignition Switch Instrument Cluster
30A EPS	Power Steering Relay / Motor
20A Lights	Head lights Tail lights Brake lights
20A Drive	AWD Coil ADC Coil Rear Differential Solenoid (X2) RH AWD / ADC switch Winch Switch Power
20A Accessory	All accessory power point pigtails
20A Flasher (INT'L Models)	Hazard and Flasher circuits

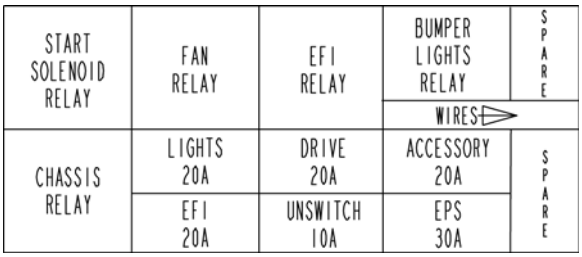
FUSE BOX LAYOUT

The fuse box is located under the front rack or storage box.

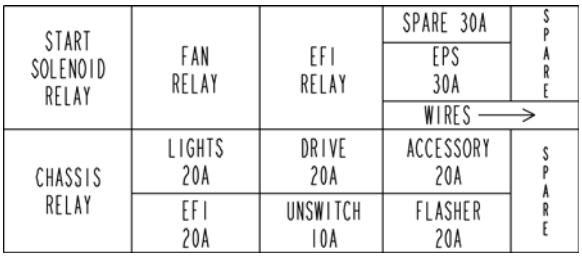
To gain access, remove the front rack or storage box assembly by unlatching the two locking anchors.



The cover label identifies the location of each relay and fuse.



INT'L Models



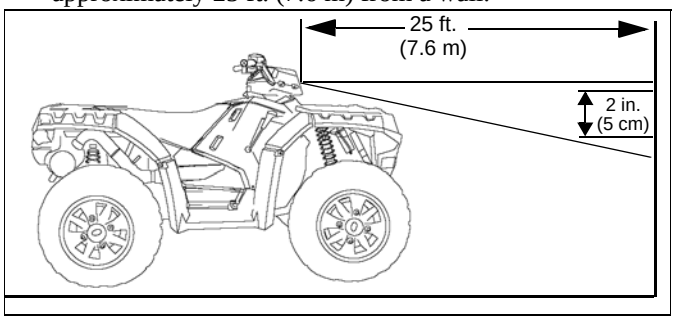
9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

LIGHTS

Headlight Adjustment

The headlight beam is adjustable.

1. Place the vehicle on a level surface with the headlight approximately 25 ft. (7.6 m) from a wall.



2. Place the transmission in neutral and lock the parking brake.

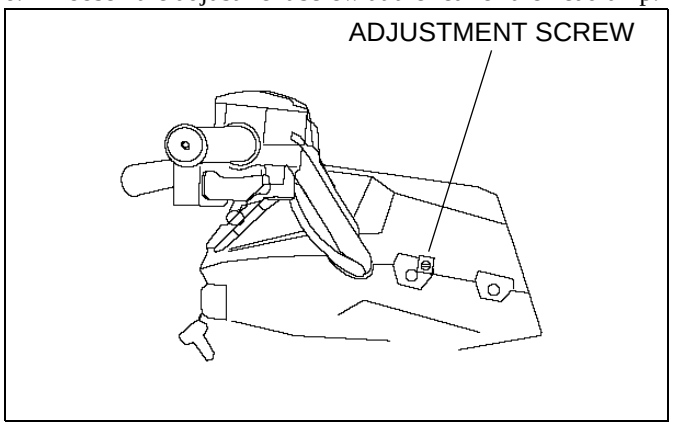
3. Measure the distance from the floor to the center of the headlight and make a mark on the wall at the same height.

NOTE: Rider weight must be included on the seat while performing this procedure.

4. Start the engine and turn the headlight switch to high beam.

5. Observe the headlight aim on the wall. The most intense part of the headlight beam should be aimed 2 in. (5 cm) below the mark placed on the wall in Step 3.

6. Loosen the adjustment screw at the rear of the headlamp.



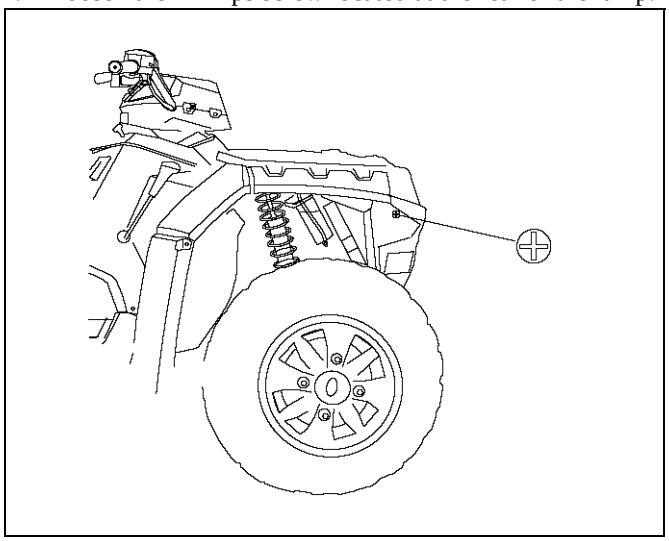
7. Adjust the beam to desired position and tighten the screw.

⚠ WARNING

Due to the nature of ATVs and where they are operated, headlight lenses become dirty. Frequent washing is necessary to maintain lighting quality. Riding with poor lighting can result in severe injury or death.

Bumper Lamp Adjustment

1. Loosen the Phillips screw located at the rear of the lamp.



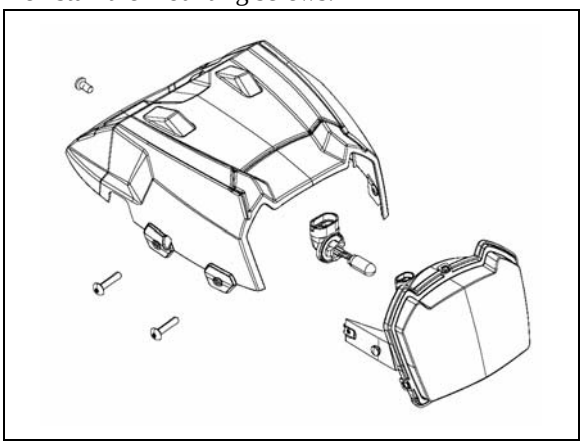
2. Tilt the lamp upward or downward to the desired position and tighten the screw.

3. Repeat the procedure to adjust the other bumper light to the same height.

9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

Headlight Replacement

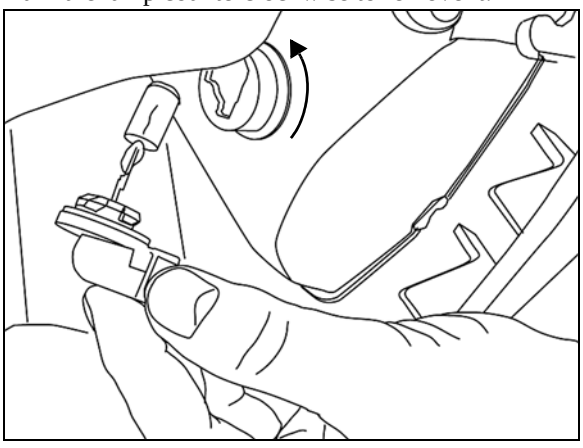
1. Remove the (4) side and (1) rear mounted pod screws.
2. Carefully remove the headlight lens from the pod.
3. Unplug the headlight from the harness and remove the bulb.
4. Install a new bulb, and install the lens back into the pod.
5. Reinstall the mounting screws.



Bumper Lamp Replacement

Before replacing the lamp, use a digital multimeter to test the harness to ensure the lamp is receiving 12 volts and that a ground path is present.

1. Disconnect the headlight lamp from the wiring harness. Be sure to pull on the connector, not on the wiring.
2. Turn the lamp counterclockwise to remove it.



3. Insert new the new lamp and turn it clockwise to secure it. Reinstall the wire harness to the lamp.

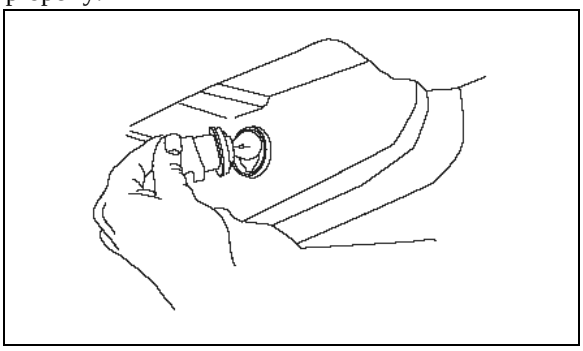
NOTE: Make sure the tab on the lamp locates properly in the housing.

Tail / Brake Bulb Replacement

Before replacing the bulb, use a digital multimeter to test the harness to ensure the lamp is receiving 12 volts and that a ground path is present. If a tail light or brake light does not work the bulb may need to be replaced.

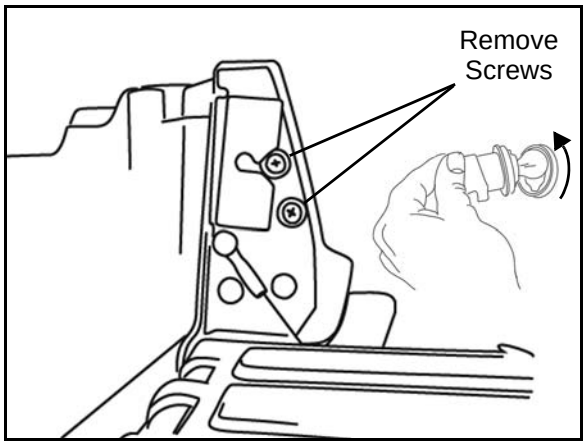
Base / TOURING Models

1. Remove bulb by turning the rubber base 1/4 turn and pulling the bulb out. Replace it with recommended bulb. Apply Dielectric Grease (PN 2871329) to the connection.
2. Test the tail light and brake light to verify it is working properly.



X2 Models

1. Open the tailgate and remove the two screws near the tailgate latch.



2. Grasp the entire taillight assembly and pull it away from the vehicle. Remove the harness connector from the back of the light assembly and turn the bulb 1/4 turn counterclockwise to remove it.
3. Reinstall the bulb. Apply dielectric grease to the electrical connection and reinstall the harness.
4. Test the light for proper operation.
5. Reinstall the taillight assembly and the two screws.

© Copyright 2010 Polaris Sales Inc.

CHARGING SYSTEM

Charging System Diagram

The charging system consists of:.

- Battery
- Stator / Alternator
- Voltage Rectifier / Regulator

Voltage Rectifier / Regulator (600 Watt)

The voltage rectifier / regulator is responsible for converting AC voltage to DC voltage and controls the DC output.

NOTE: If the temperature of the regulator / rectifier exceeds 194 °F (90°C), the unit will turn itself off to cool down. The unit will turn on at approximately 167°F (75°C). If voltage output is equal to or less than static battery voltage, verify the housing cooling fins are clean, free from debris and that adequate airflow is present.

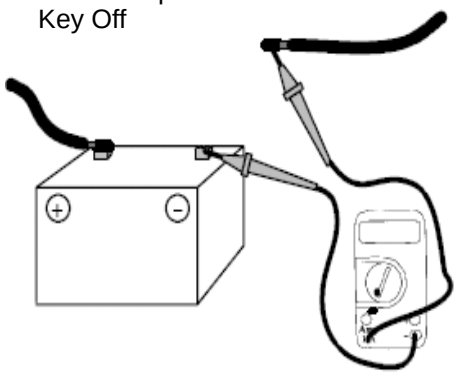
Current Draw - Key Off

⚠ CAUTION

Do not connect or disconnect the battery cable or ammeter with the engine running. Damage will occur to electrical components.

Connect an ammeter in series with the negative battery cable. Check for current draw with the key off. If the draw is excessive, loads should be disconnected from the system one by one until the draw is eliminated. Check component wiring as well as the component for partial shorts to ground to eliminate the draw.

Current Draw Inspection
Key Off



Current Draw - Key Off:
Maximum of .01 DCA (10 mA)

Battery Charge Test

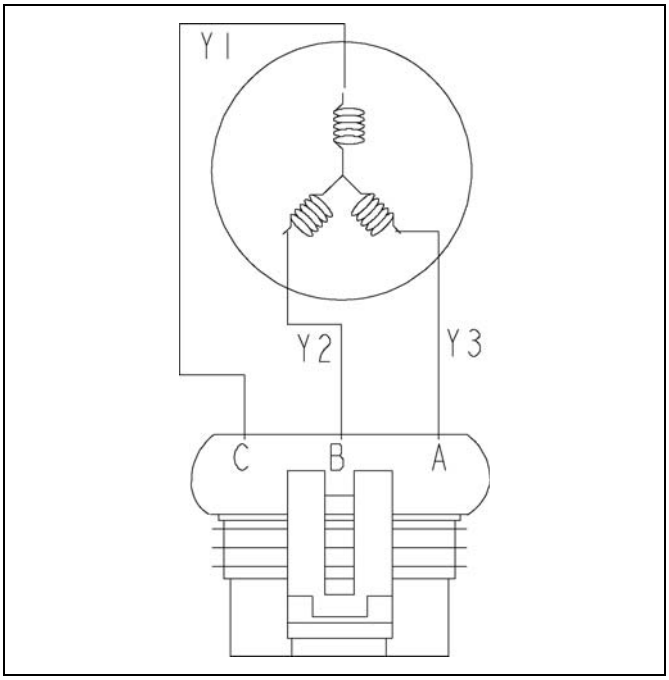
⚠ CAUTION

Do not allow the battery cables to become disconnected with the engine running. Follow the steps below as outlined to reduce the chance of damage to electrical components.

1. Verify the battery is fully charged and in good condition.
2. With the engine running, connect the multimeter to the positive and negative battery terminals.
3. Test for Vdc with the multimeter.
4. The meter display should read approximately 14.0 - 14.4 Vdc at idle.
5. If the voltage is lower than 14.0 - 14.4 Vdc, the alternator should be tested.

Stator / Alternator Tests

Three tests can be performed using a multimeter to determine the condition of the stator (alternator).



9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

TEST 1: Resistance Value of Each Stator Leg

1. Measure the resistance value of each of the three stator legs.

Test	Connect Meter Leads To:	Ohms Reading
Charge Coil	Y1 to Y2 (Pin B to C)	0.19Ω ± 15%
Charge Coil	Y1 to Y3 (Pin A to C)	0.19Ω ± 15%
Charge Coil	Y2 to Y3 (Pin A to B)	0.19Ω ± 15%

NOTE: If there are any significant variations in ohm readings between the three legs, one of the three stator legs may be weak or failed.

TEST 2: Resistance Value of Each Stator Leg to Ground

1. Measure the resistance value of each of the stator legs to ground.

Test	Connect Meter Leads To:	Ohms Reading
Battery Charge Coil	Y1, Y2, or Y3 to Ground	Open Line (Infinity)

NOTE: Any measurement other than Infinity (open) will indicate a failed or shorted stator leg.

TEST 3: Measure AC Voltage Output of Each Stator Leg at Charging RPM

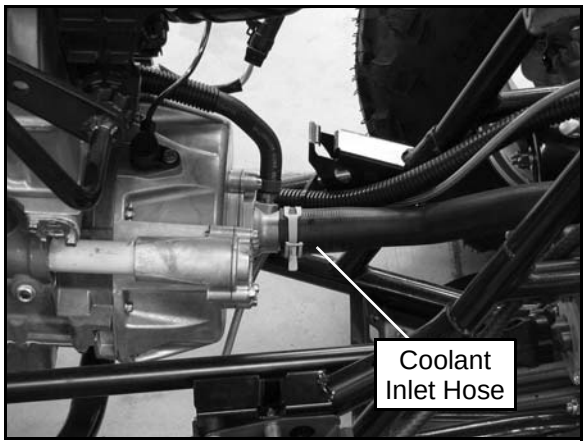
1. Set your multimeter meter to measure AC Voltage.
2. Disconnect the 3-wire stator connector near the stator housing.
3. Start the engine and let it idle.
4. While holding the engine at a specified RPM, separately measure the voltage across each 'leg' of the stator by connecting the meter leads to the wires leading from the stator (Y1 to Y2, Y1 to Y3, Y2 to Y3).
5. Refer to the following table for approximate AC Voltage readings according to RPM. Test each leg at the specified RPM in the table.

NOTE: If one or more of the stator leg output AC voltage varies significantly from the specified value, the stator may need to be replaced.

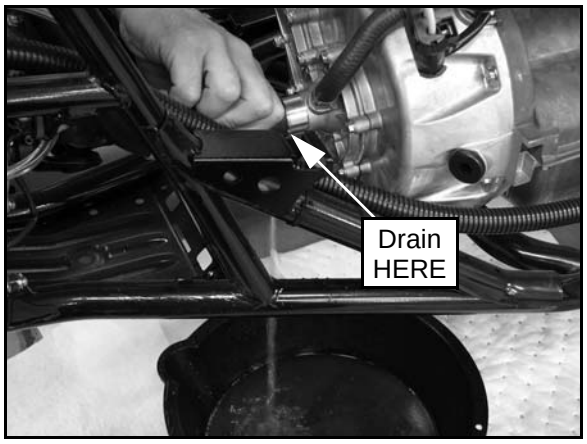
RPM Reading	AC Voltage Reading
6000	115 Vac ± 10 % (Nominal) 171 Vac ± 10 % (Peak)

Stator / Alternator Removal

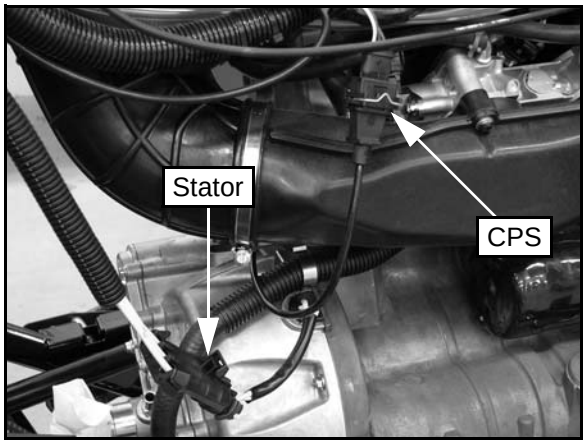
1. Remove the fuel tank (see Chapter 3).
2. Remove the (4) screws retaining the engine skid plate and remove the plate from the vehicle.
3. Place a drain pan under the front portion of the engine.
4. Remove the coolant hose from the water pump housing.



5. Slowly drain the coolant into the drain pan. Dispose of used coolant properly.



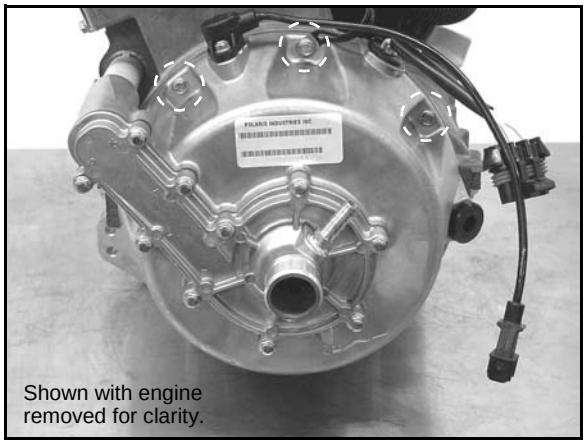
6. Disconnect the stator and CPS wire harnesses.



9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

7. Remove the coolant by-pass hose from the water pump cover fitting.

8. Remove the (8) screws retaining the stator cover.

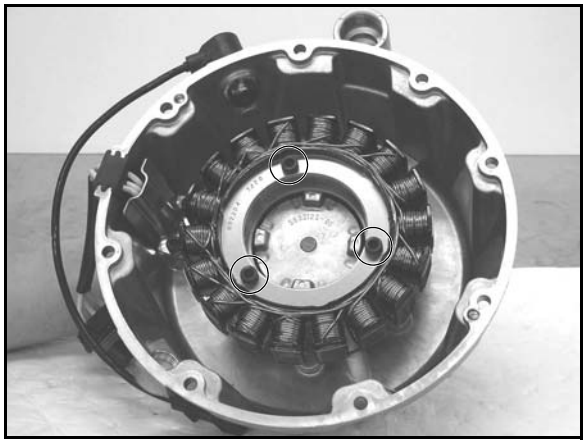


9. Carefully remove the stator cover taking care not to damage the plastic coolant pipe.

⚠ CAUTION

The flywheel contains powerful magnets. Use caution when removing and installing the stator cover. DO NOT place fingers between cover and crankcase at any time during the removal / installation process or injury could result.

10. Remove the CPS, stator wire guide, and stator from the cover.

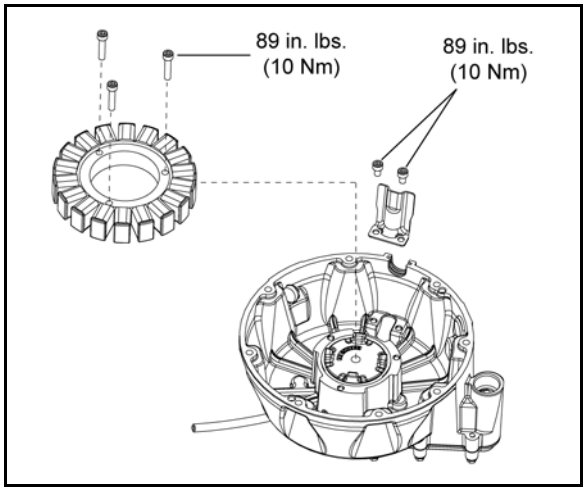


Stator / Alternator Installation

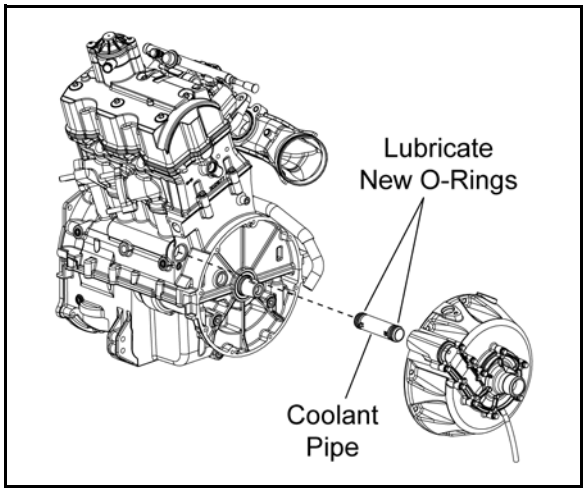
1. Reverse the “Stator / Alternator Removal” procedure to reinstall the stator.

2. Use the following steps to ensure proper assembly.

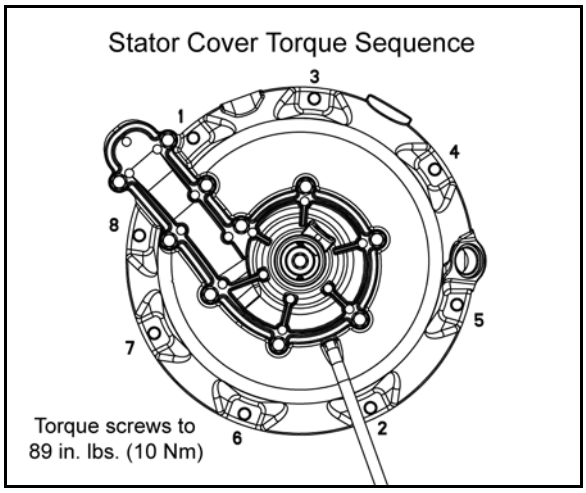
3. Torque the stator and wire guide bolts to specification.



4. Install new O-rings on the coolant pipe and lightly lubricate for ease of installation.



5. Torque the (8) stator cover bolts to specification using the torque sequence provided.



© Copyright 2010 Polaris Sales Inc.

BATTERY SERVICE

Battery Specifications

Battery PN 4011496

Type	Polaris / Yuasa YTX20HL-BS Sealed - Maintenance Free
Voltage	12 Vdc
Nominal Capacity @ 10 HR Rate	18 AH
CCA	310
Nominal Open Circuit Voltage	12.8 Vdc or more.
Recommended Charging Rate	1.8A @ 5-10 HR

General Battery Information

⚠ WARNING

CALIFORNIA PROPOSITION 65 WARNING: Batteries, battery posts, terminals and related accessories contain lead and lead compounds, and other chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. WASH HANDS AFTER HANDLING.

⚠ WARNING

Battery electrolyte is poisonous. It contains acid! Serious burns can result from contact with the skin, eyes, or clothing.

ANTIDOTE:
External: Flush with water.

Internal: Drink large quantities of water or milk. Follow with milk of magnesia, beaten egg, or vegetable oil. Call a physician immediately.

Eyes: Flush with water for 15 minutes and get prompt medical attention.

Batteries produce explosive gases. Keep sparks, flame, cigarettes, etc. away. Ventilate when charging or using in closed space. Always shield eyes when working near batteries.

Keep out of reach of children.

1. Check battery voltage with a volt/ohm meter. A fully charged battery should be 12.8 V or higher.

2. If the voltage is below 12.6 V, the battery will need to be recharged (see “Charging Procedure”).

IMPORTANT: Never attempt to add electrolyte or distilled water to a Maintenance Free battery. Doing so will damage the case and shorten the life of the battery.

To service a Maintenance Free battery:

1. Remove battery from the vehicle (see Chapter 2).

2. Test battery with a voltage meter or load tester to determine battery condition. This will determine the length of time required to charge the battery to full capacity. Refer to OCV table (see “OCV - Open Circuit Voltage Test”).

3. Charge the battery as recommended (see “Charging Procedure”).

Battery Removal / Installation

See Chapter 2 “Maintenance” for battery removal and installation procedures.

Battery Off Season Storage

Whenever the vehicle is not used for a period of three months or more, remove the battery from the vehicle, ensure that it's fully charged, and store it out of the sun in a cool, dry place. Check battery voltage each month during storage and recharge as needed to maintain a full charge.

NOTE: Battery charge can be maintained by using a Polaris battery tender charger or by charging once a month to make up for normal self-discharge. Battery tenders can be left connected during the storage period, and will automatically charge the battery if the voltage drops below a pre-determined point.

Battery Testing

Whenever a service complaint is related to either the starting or charging systems, the battery should be checked first.

Following are two tests which can easily be made on a sealed Maintenance Free battery to determine its condition: OCV Test and a Load Test.

© Copyright 2010 Polaris Sales Inc.

OCV - Open Circuit Voltage Test

Battery voltage should be checked with a digital multitester. Readings of 12.6 volts or less require further battery testing and charging. See the following chart and "Load Test".

NOTE: Maintenance Free batteries should be kept at a high state of charge during storage. If the battery is stored or used at a low state of charge, hard crystal sulfation will form on the plates, reducing the efficiency and service life of the battery.

NOTE: Use a volt/ohm meter to test battery voltage.

Battery PN 4011496

OPEN CIRCUIT VOLTAGE	
State of Charge	**Maintenance Free**
100%	13.0 V
75% Charged	12.8 V
50% Charged	12.5 V
25% Charged	12.0 V
0% Charged	11.5 V or less

Load Test

⚠ CAUTION

To prevent shock or component damage, remove spark plug high tension leads and connect securely to engine ground before proceeding.

A battery may indicate a full charge condition in the OCV test, but still may not have the storage capacity necessary to properly function in the electrical system. For this reason, a battery capacity or load test should be conducted whenever poor battery performance is encountered.

To perform this test, use a load testing device that has an adjustable load. Apply a load of three times the ampere-hour rating. At 14 seconds into the test, check battery voltage. A good 12V battery will have at least 10.5 volts. If the reading is low, charge the battery and retest.

Battery Conductance Analyzer

Conductance describes the ability of a battery to conduct current. A conductance tester functions by sending a low frequency AC signal through the battery and a portion of the current response is captured, from this output a conductance measurement is calculated. Conductance testing is more accurate than voltage, specific gravity, or load testing.

Authorized Polaris dealers/distributors are required to use the conductance analyzer when testing 12V Polaris batteries.

Polaris MDX-610P
SPX PN: PU-50296

Extreme Use 30 AH Battery

Polaris offers an optional 30 AH battery (**PN 4011224**) for use in extreme conditions where the factory installed battery can not maintain a charge because of multiple electrical accessories.

Charging Procedure

If battery voltage is 12.6 Vdc or less, the battery may need recharging. When using an automatic charger, refer to the charger manufacturer's instructions for recharging.

Do not exceed 9 amps when charging the 4011496 battery.

NOTE: Charge the battery using an automatic charger that will not exceed 14.6 Vdc. An automatic charger will signal when charging is complete.

© Copyright 2010 Polaris Sales Inc.

NOTE: Allow the battery to stand disconnected for at least 1-2 hours after being properly charged. If the voltage drops below 12.6 volts, charging was ineffective or the battery needs to be replaced.

⚠ WARNING

An overheated battery could explode, causing severe injury or death. Always watch charging times carefully. Stop charging if the battery becomes very warm to the touch. Allow it to cool before resuming charging.

Battery PN 4011496

State of Charge	Voltage (DC)	Action	Charge Time
100%	12.8 - 13.0	None, check again in 3 months	None Required
75% - 100%	12.5 - 12.8	May need slight charge	3 - 6 hrs
50% - 75%	12.0 - 12.5	Needs Charge	5 - 11 hrs
25% - 50%	11.5 - 12.0	Needs Charge	At least 13 hrs
0% - 25%	11.5 or less	Needs Charge	At least 20 hrs

NOTE: Follow the charger instructions supplied by the manufacture regarding the order or connections, switch positions and when to connect the charger to an outlet.

STARTER MOTOR

Starter / Starter Lockout System Diagram

The starter and starter lockout system consists of:

- Battery / Fuse or Circuit Breaker
- Key Switch / Off/Run Switch
- Starter Solenoid
- Brake Switch / Transmission (Neutral) Switch
- Start Diode
- Starter Motor

Troubleshooting

Starter Motor Does Not Run

- Battery discharged
- Loose or faulty battery cables or corroded connections (see Voltage Drop Tests)
- Related wiring loose, disconnected, or corroded
- Poor ground connections at battery cable, starter motor or starter solenoid (see Voltage Drop Tests)
- Faulty key switch or Off/Run Switch
- Faulty transmission switch
- Faulty Start Diode(s). Use a digital multi-meter to test diode operation. Locate the diode(s) in the main harness under the hi-temp conduit and measure between the diode connections. Continuity should flow one direction only.
- Faulty starter solenoid or starter motor
- Engine problem - seized or binding (can engine be rotated easily)

Starter Motor Turns Over Slowly

- Battery discharged
- Excessive circuit resistance - poor connections (see Voltage Drop Test)
- Engine problem - seized or binding (can engine be rotated easily)
- Faulty or worn brushes in starter motor

Starter Motor Turns - Engine Does Not Rotate

- Faulty starter drive
- Faulty starter drive gears or starter motor gear
- Faulty flywheel gear or loose flywheel

Voltage Drop Testing

The Voltage Drop Test is used to test for bad connections. When performing the test, you are testing the amount of voltage drop through the connection. A poor or corroded connection will appear as a high voltage reading. Voltage shown on the meter when testing connections should not exceed 0.1 VDC per connection or component.

To perform the test, place the meter on DC volts and place the meter leads across the connection to be tested. Refer to the chart on 9.35 to perform voltage drop tests on the starter system.

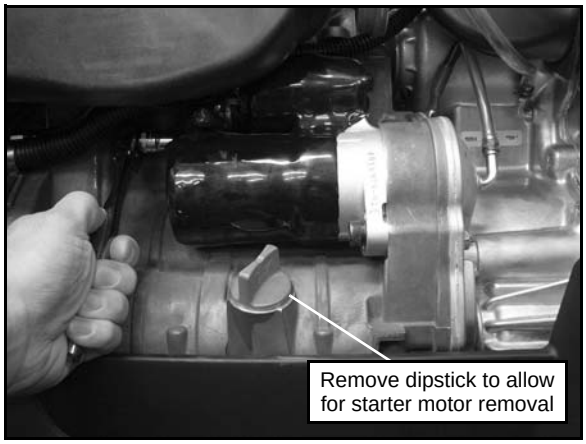
Voltage should not exceed 0.1 Vdc per connection.

© Copyright 2010 Polaris Sales Inc.

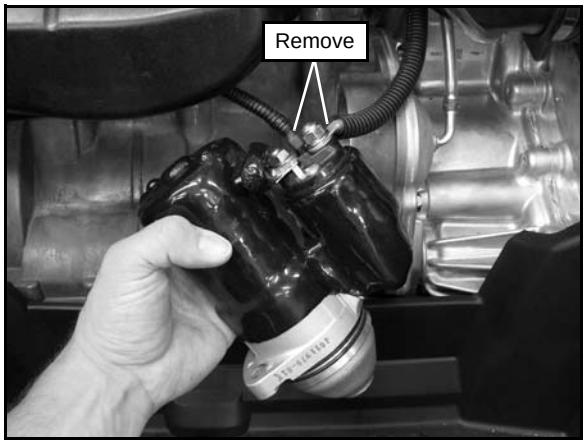
Starter Motor Removal / Replacement

IMPORTANT: The starter motor and solenoid can not be serviced. Removing the black protective coating from the components will allow for premature component failure. Replace the starter motor and solenoid as an assembly.

1. Remove the seat and the upper and lower LH side panels.
2. Disconnect the battery negative (-) cable.
3. Clean the area around the starter motor.
4. Using an 8 mm allen socket, with an extension, remove the (2) bolts retaining the starter motor.

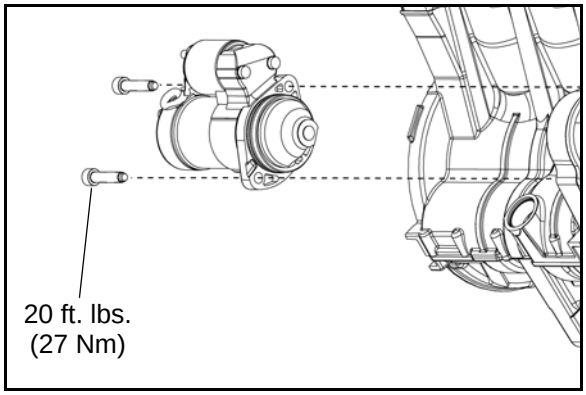


5. Remove the engine oil dipstick to allow for starter motor removal.
6. Remove the starter motor from the crankcase housing. Reinstall the engine oil dipstick.
7. Remove the key switch energize wire and battery cable from the starter solenoid. Remove the starter motor assembly from the chassis.



8. Install the new starter motor assembly by reversing this procedure.
9. Be sure to install new O-rings on the starter motor bell housing.

10. Torque the mounting bolts to specification.



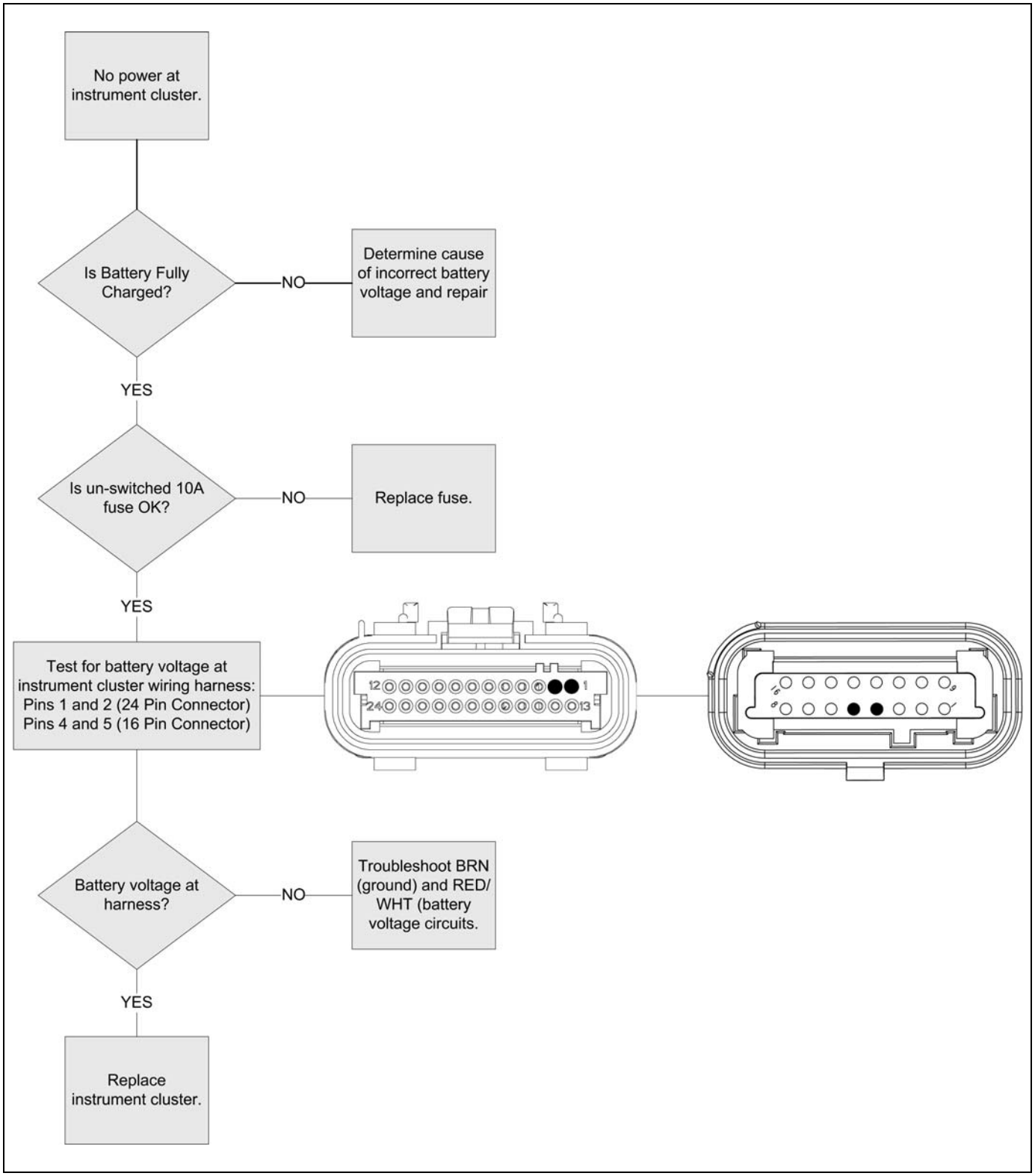
= T
Starter Motor Mounting Bolts: **20 ft. lbs. (27 Nm)**

9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

INSTRUMENT CLUSTER TROUBLESHOOTING

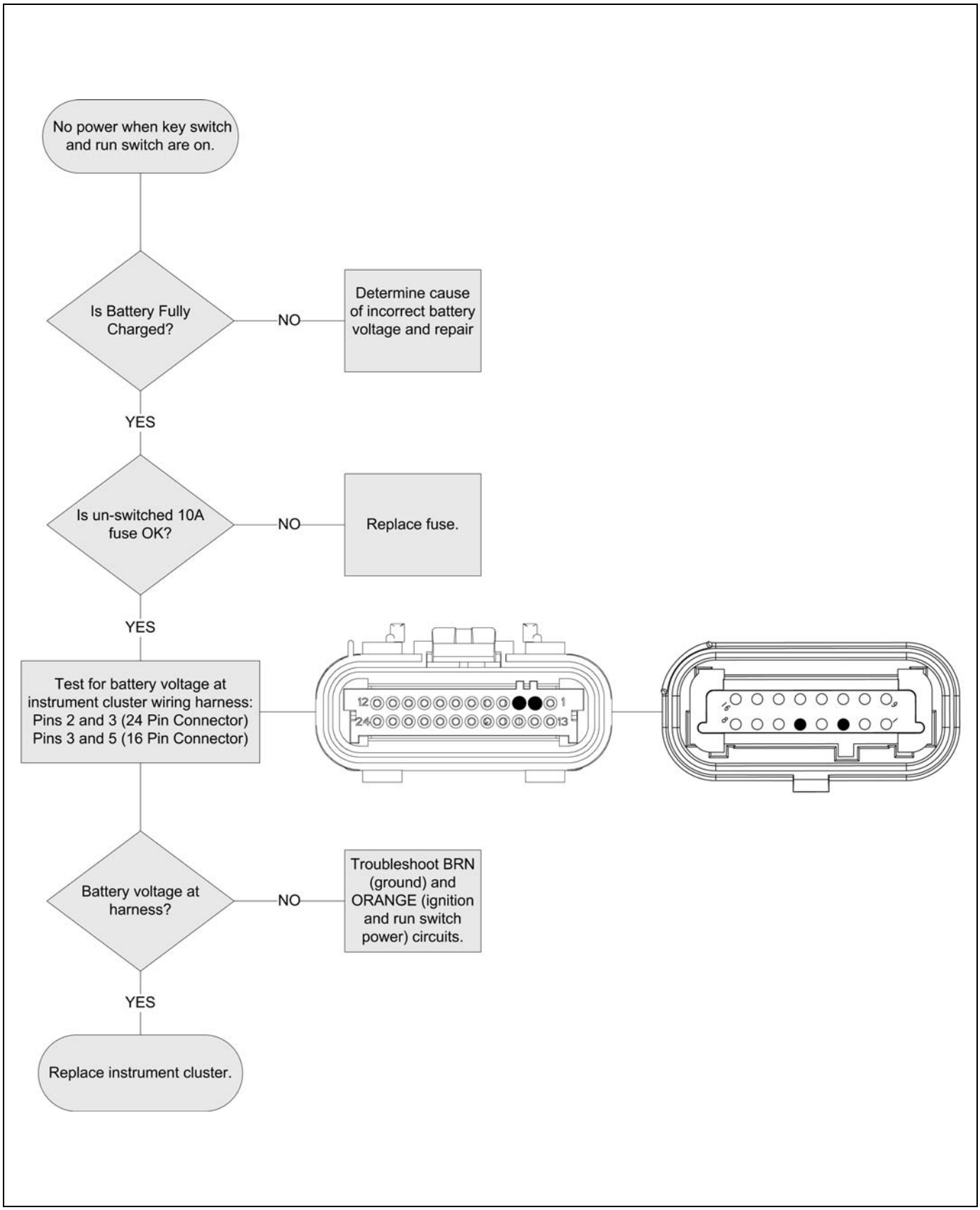
The following 4 diagnostic tests can be performed without using Digital Wrench. Troubleshooting functions not listed here can be found using Digital Wrench Guided Diagnostics.

Instrument Cluster - Key OFF / No Power



© Copyright 2010 Polaris Sales Inc.

Instrument Cluster - Key ON / No Power



© Copyright 2010 Polaris Sales Inc.

Instrument Cluster - No High Beam Indicator

No high beam indicator on instrument panel when high beam lamp activated.

Is Battery Fully Charged?

NO — Determine cause of incorrect battery voltage and repair

YES

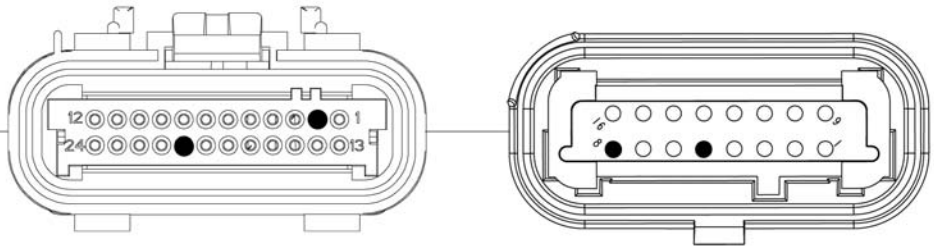
LIGHTS 20A fuse OK?

NO — Replace fuse.

YES

Move key switch to ON, LH switch to RUN and headlamp switch to HIGH.

Test for battery voltage at instrument cluster wiring harness: Pins 2 and 20 (24 Pin Connector Pins 5 and 8 (16 Pin Connector)



Battery voltage at harness?

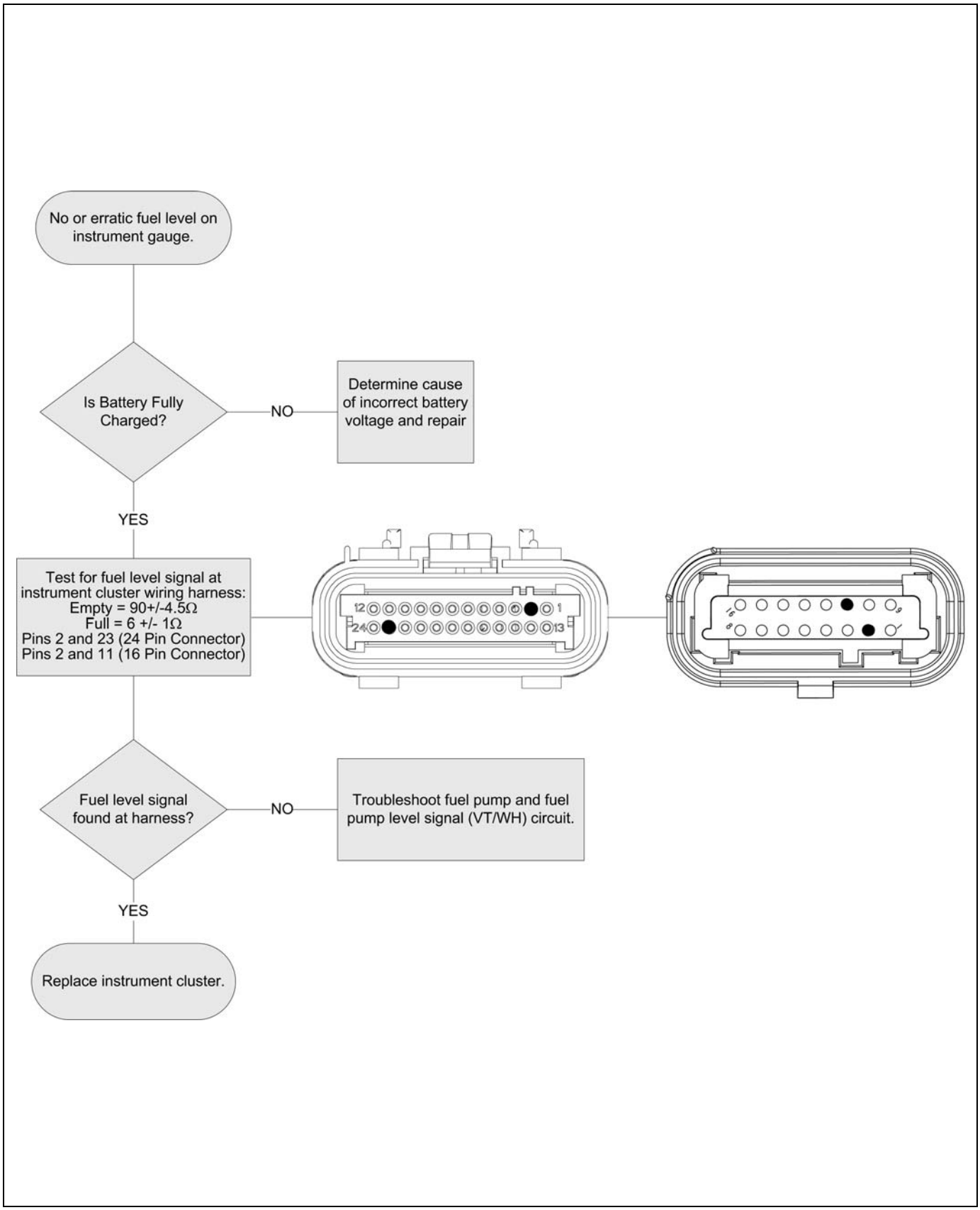
NO — Troubleshoot BRN (ground) and YELLOW (high beam voltage) circuits.

YES

Replace instrument cluster.

© Copyright 2010 Polaris Sales Inc.

Instrument Cluster - No / Incorrect Fuel Level


No or erratic fuel level on instrument gauge.
Is Battery Fully Charged?
NO
Determine cause of incorrect battery voltage and repair
YES
Test for fuel level signal at instrument cluster wiring harness:
Empty = 90+/-4.5Ω
Full = 6 +/- 1Ω
Pins 2 and 23 (24 Pin Connector)
Pins 2 and 11 (16 Pin Connector)
12
1
24
13
Fuel level signal found at harness?
NO
Troubleshoot fuel pump and fuel pump level signal (VT/WH) circuit.
YES
Replace instrument cluster.

9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

ELECTRONIC POWER STEERING (EPS)

EPS Operation

The EPS module is an intelligent electronic power steering system that operates off of the vehicle's 12V electrical system. It calculates steering assist by sensing the difference between the input torque of the steering post and the output torque required to turn the wheels, and then provides assist by energizing an electric motor. The process provides a smooth, seamless assist.

The system is continuously running diagnostic checks and monitoring factors such as battery voltage, ground speed and engine speed. In the event an internal or external issue that affects the EPS system is detected, the system will illuminate a fault indicator and transition to a normal mechanically coupled steering system. The system is Polaris Digital Wrench™ compatible for simplified diagnostics and system troubleshooting through the vehicle's diagnostic port.

With the engine off and the key on, the power steering unit will operate for up to five minutes. After the five minutes, you will need to either cycle the key switch or start the engine to regain power steering operation.

The Power Steering 30A Fuse.

- If the fuse fails, the Power Steering Malfunction Indicator Light (MIL) on the instrument cluster will illuminate. During this time, the vehicle will have no power steering operation. You will be able to connect and communicate with the vehicle's Engine Controller, but not the Power Steering Controller, while using Digital Wrench™.

NOTE: DO NOT SPLICE OR CUT INTO THE CAN CIRCUITS.

⚠ WARNING

Electronic Power Steering (EPS) units are not interchangeable between ATV and *RANGER* product lines.

NOTE: Refer to Chapter 10 "Steering / Suspension" for power steering unit removal and installation procedures.

EPS 8-Way Wire Harness Connector

The 8-way connector, two rows of four pins, does not have a channeled lock on both sides, allowing it to be installed 180° from its intended position. The connector will not positively engage or snap into place while in the wrong position, but can still be installed. If the connector is not installed correctly, the Power Steering Unit will not function. This situation can be avoided by paying close attention when installing the 8-way connector. If the 8-way is connected properly, the vehicle should have assist with the key on.

Wire Color Functions

Wire Color	Function
ORANGE	Key-On / Run Switch On Battery Voltage EPS Power
RED	Battery Voltage
BROWN	Ground
YELLOW	CAN High Signal
GREEN	CAN Low Signal

Proper EPS System Diagnosing

READ BEFORE YOU REPLACE THE EPS UNIT!

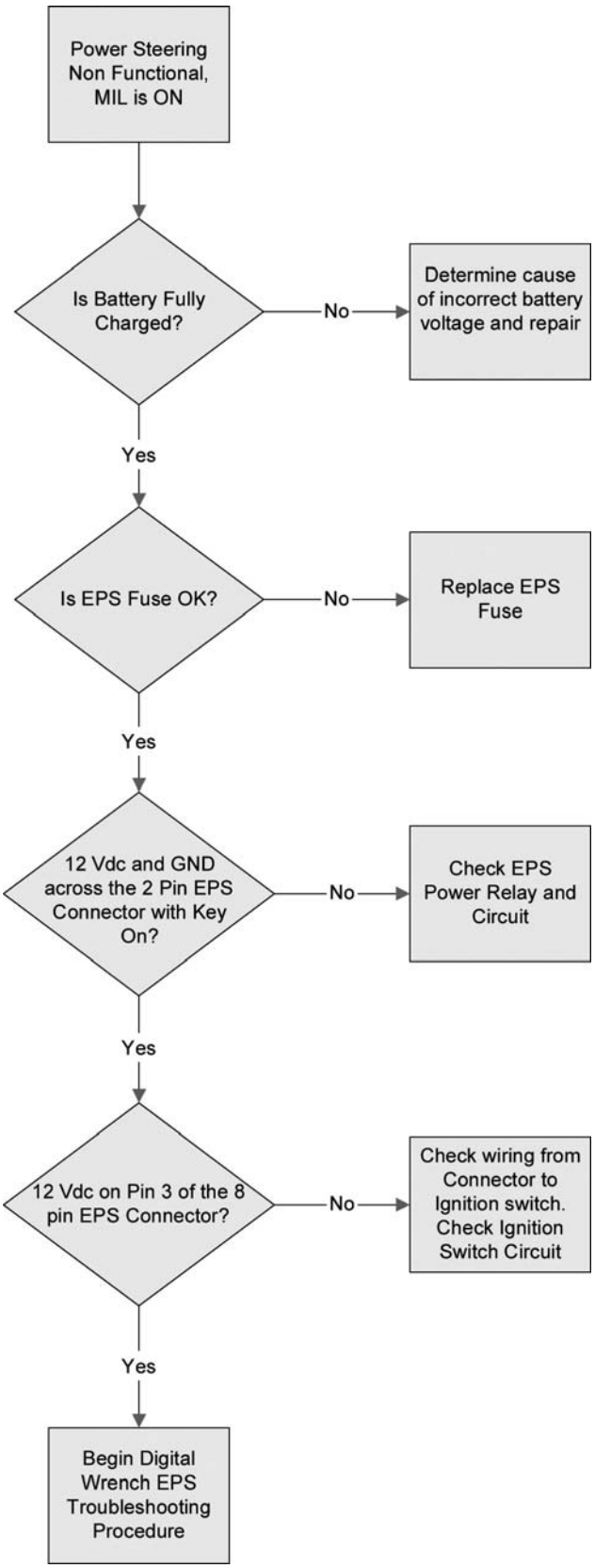
IMPORTANT: Try to reflash the EPS unit before attempting to replace it. A simple reflash may be all that is needed to repair the EPS problem. Always reflash the EPS unit as the first step in diagnosing an EPS problem.

EPS Circuit

NOTE: Refer to "Cooling Fan & EPS" breakout diagram near the end of this Chapter.

9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

EPS Troubleshooting


Power Steering Non Functional, MIL is ON
Is Battery Fully Charged?
No
Determine cause of incorrect battery voltage and repair
Yes
Is EPS Fuse OK?
No
Replace EPS Fuse
Yes
12 Vdc and GND across the 2 Pin EPS Connector with Key On?
No
Check EPS Power Relay and Circuit
Yes
12 Vdc on Pin 3 of the 8 pin EPS Connector?
No
Check wiring from Connector to Ignition switch. Check Ignition Switch Circuit
Yes
Begin Digital Wrench EPS Troubleshooting Procedure

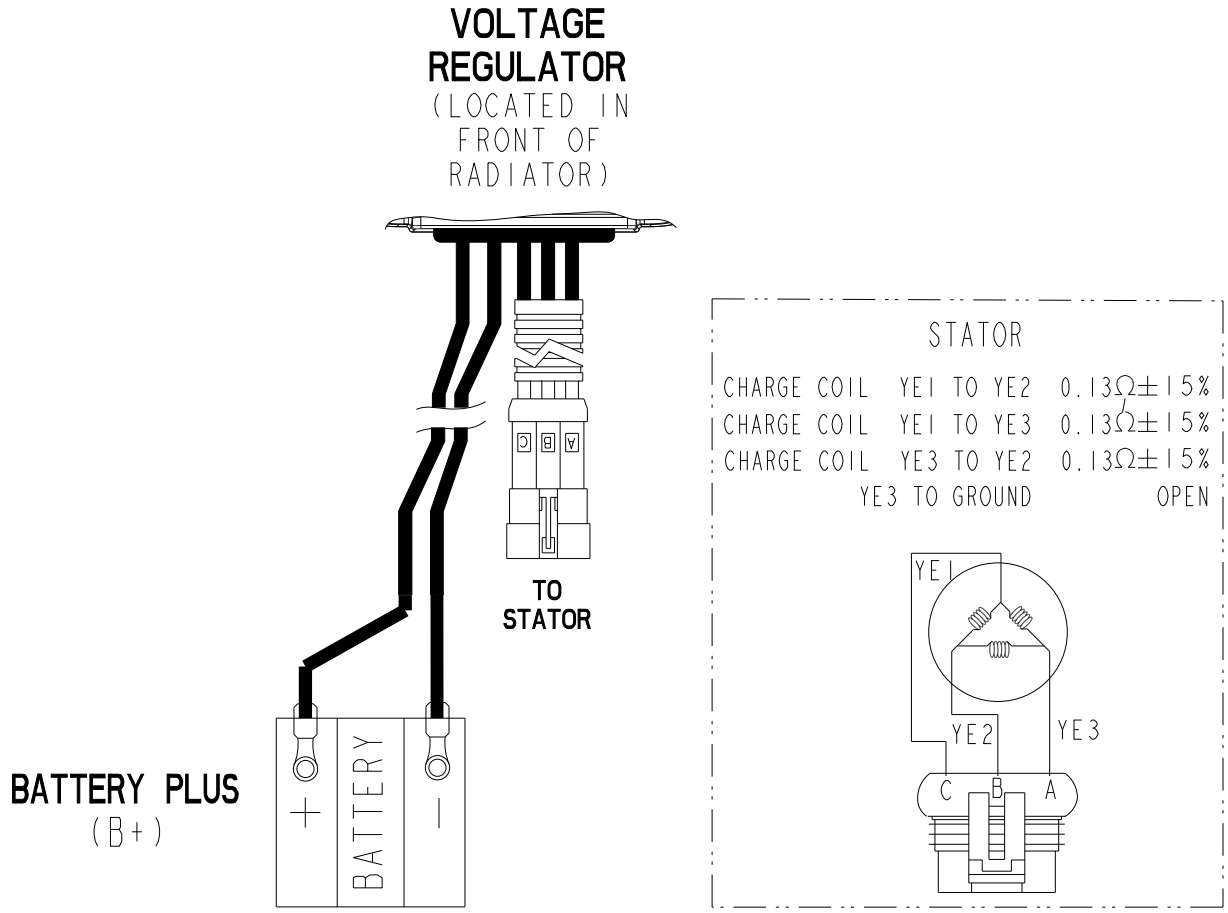
© Copyright 2010 Polaris Sales Inc.

ELECTRICAL BREAKOUT DIAGRAMS

Battery Charging Circuits

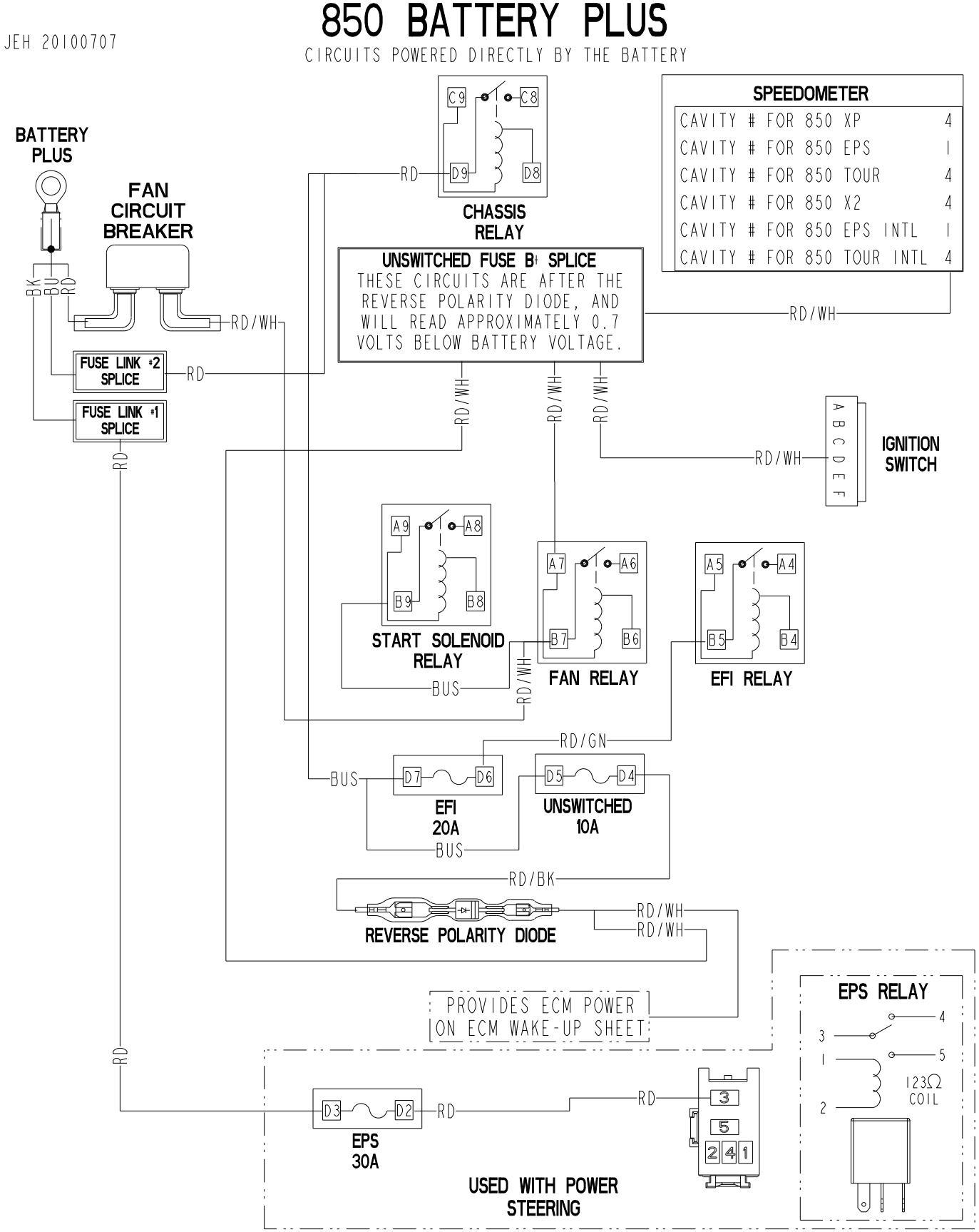
JEH 20100707

BATTERY CHARGING



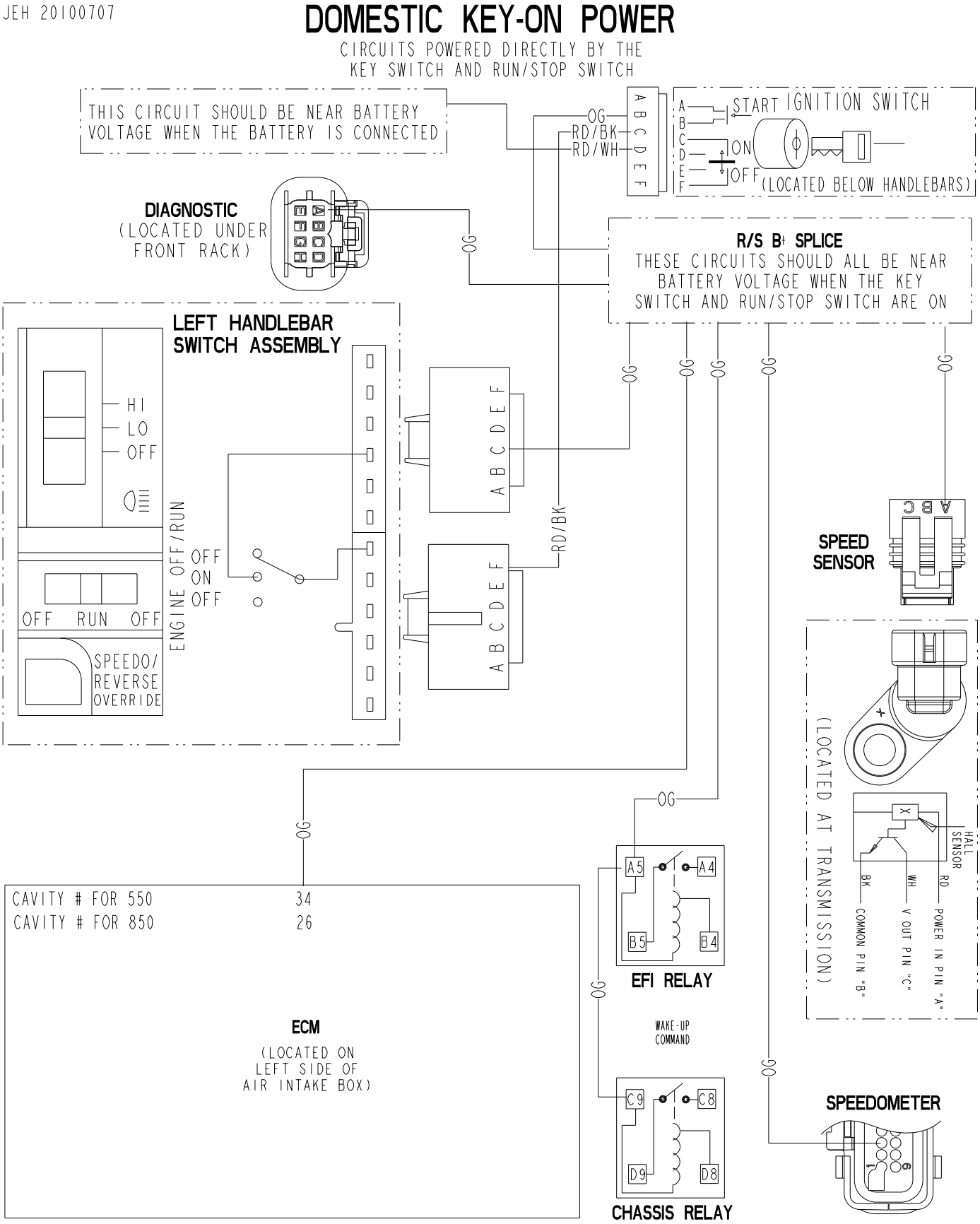
9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

Constant Power Circuits



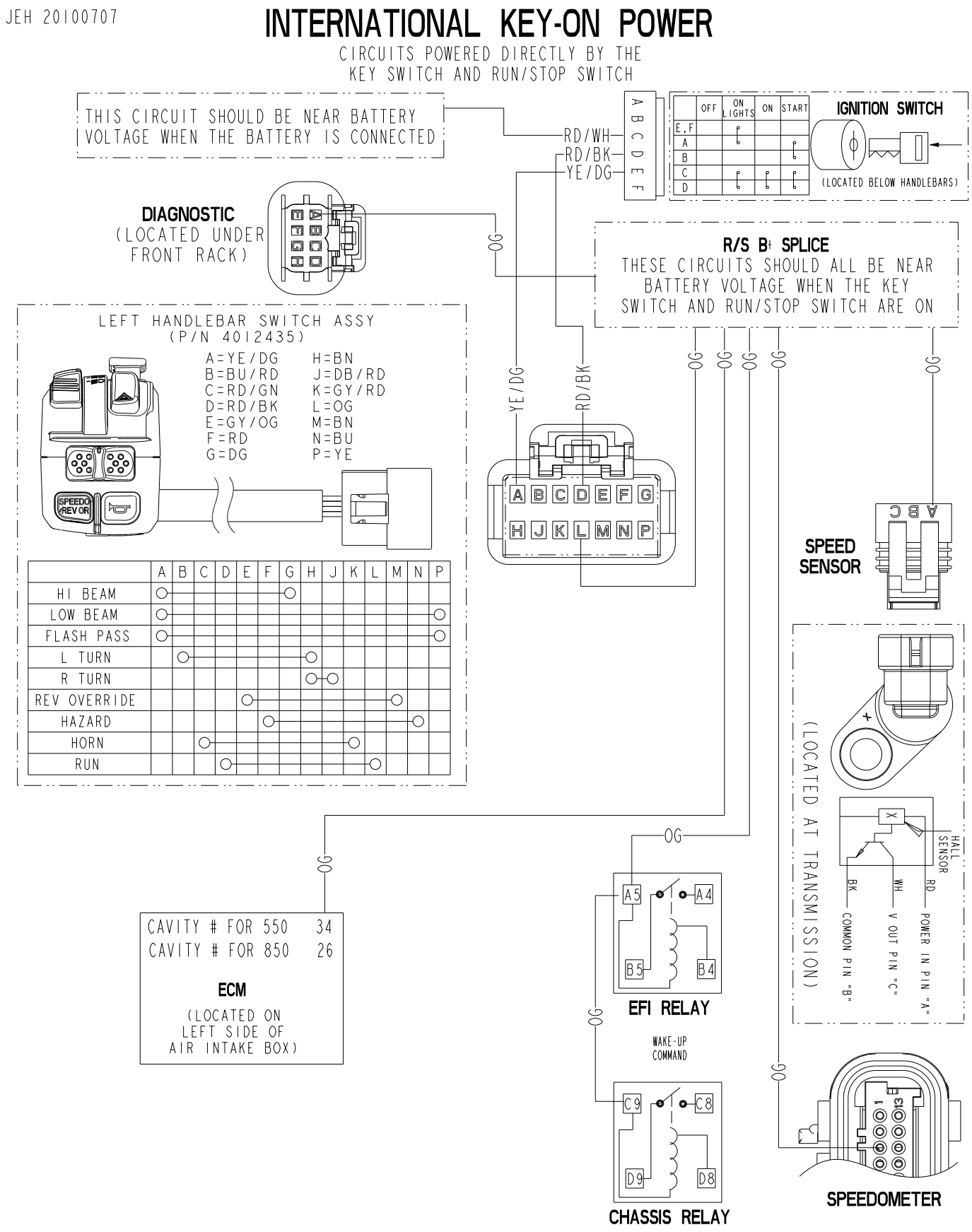
9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

Key-On Power Circuits



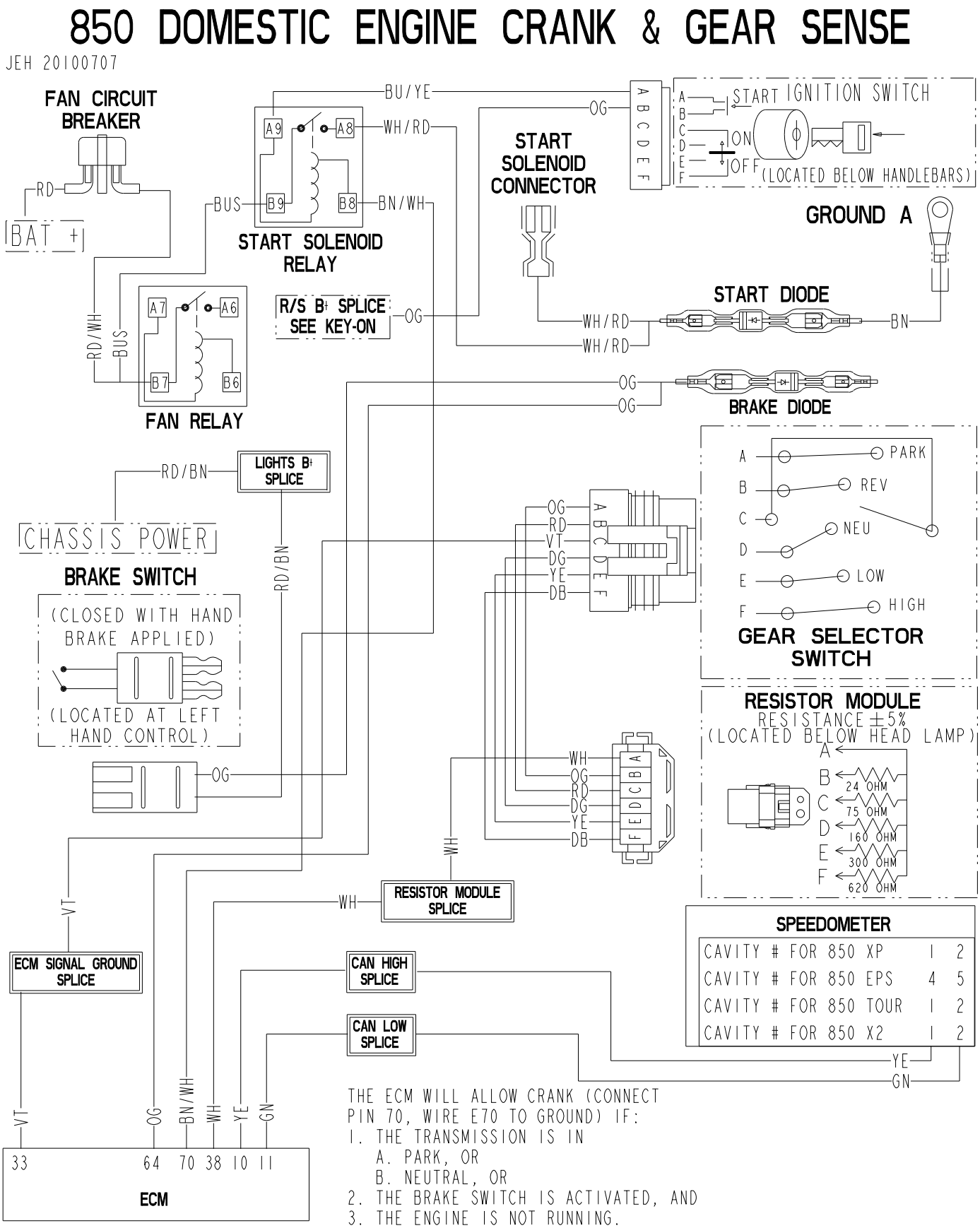
© Copyright 2010 Polaris Sales Inc.

Key-On Power Circuits (Int'l Models)



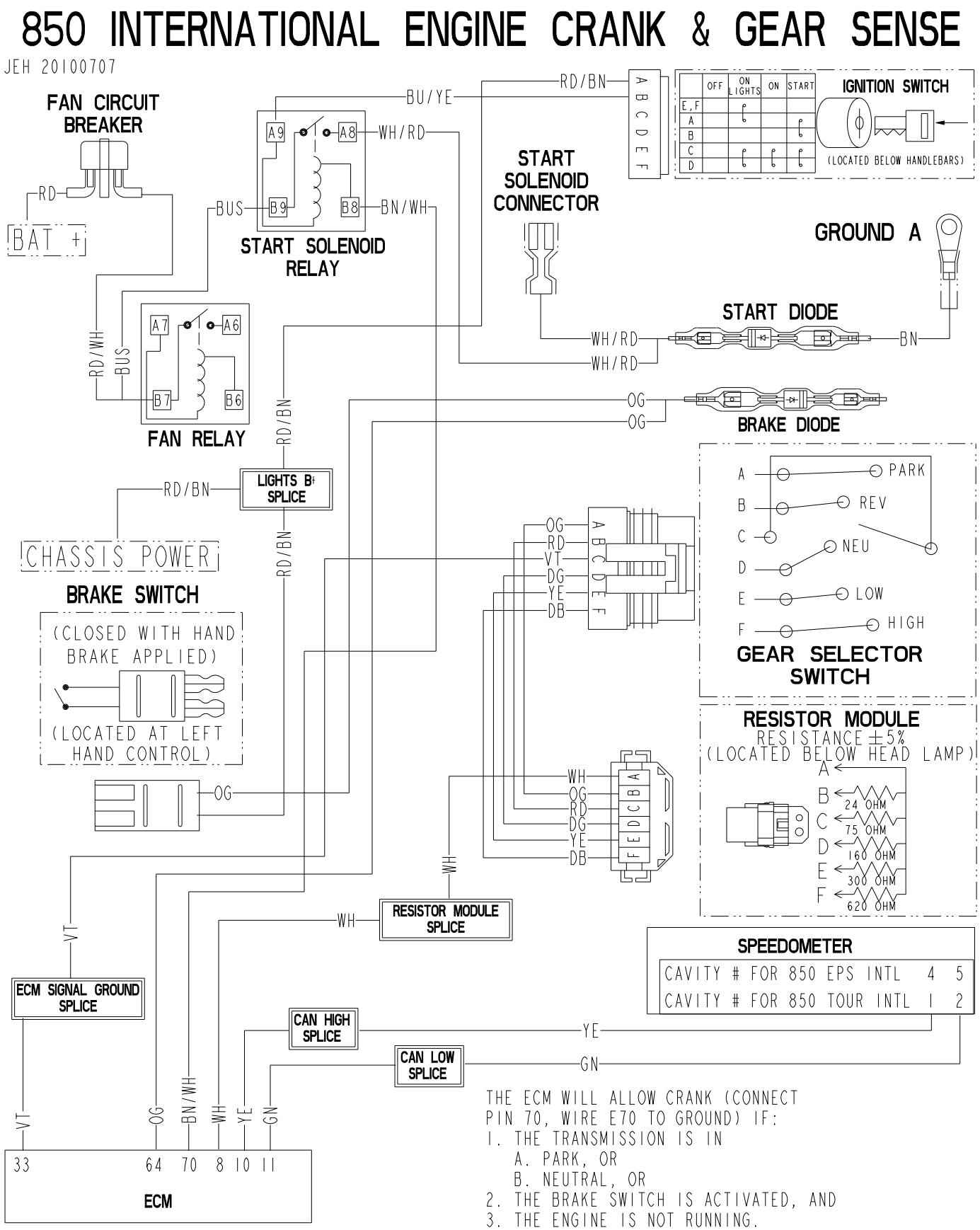
9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

Engine Start Command and Gear Switch Circuits



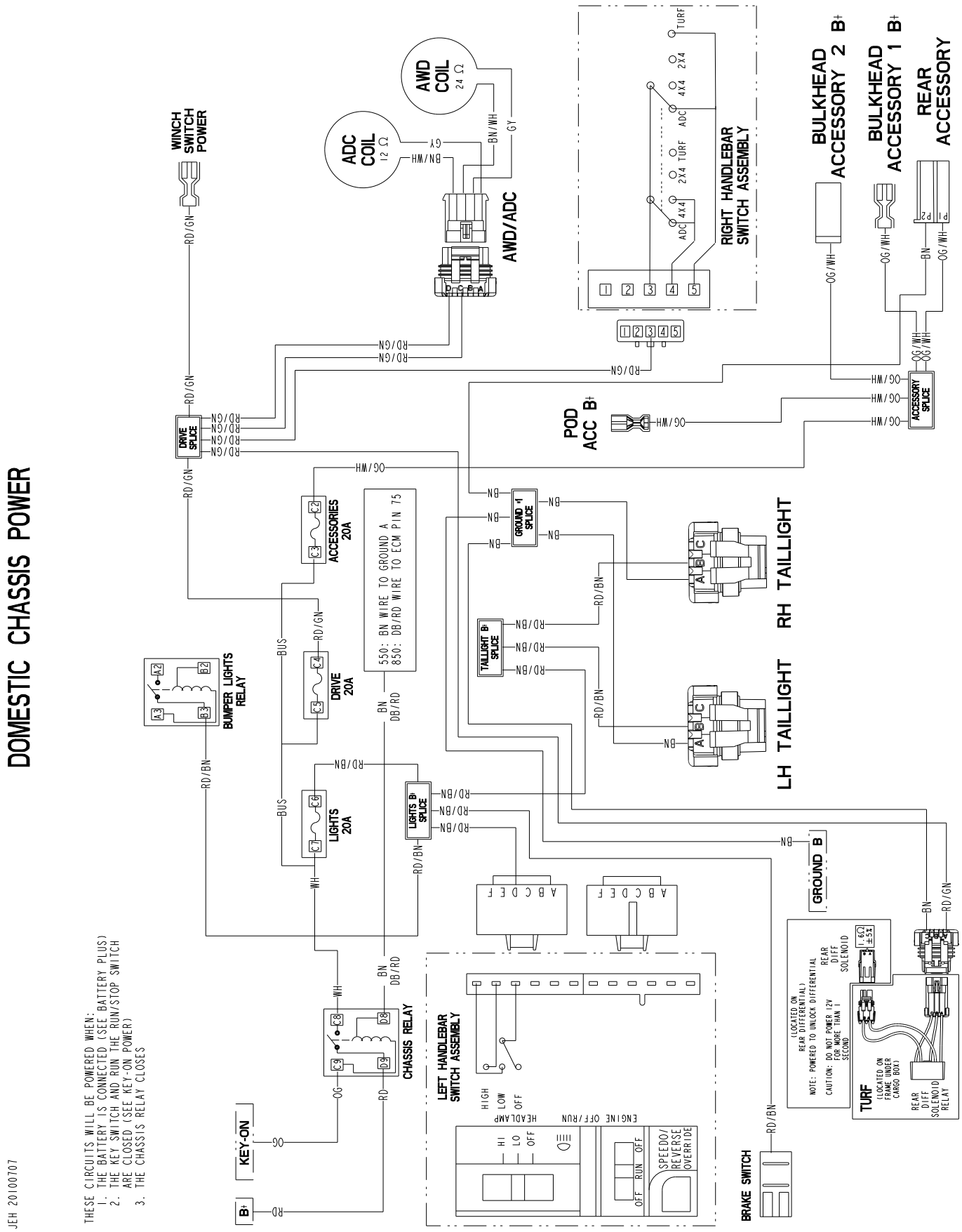
9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

Engine Start Command and Gear Switch Circuits (Int'l Models)



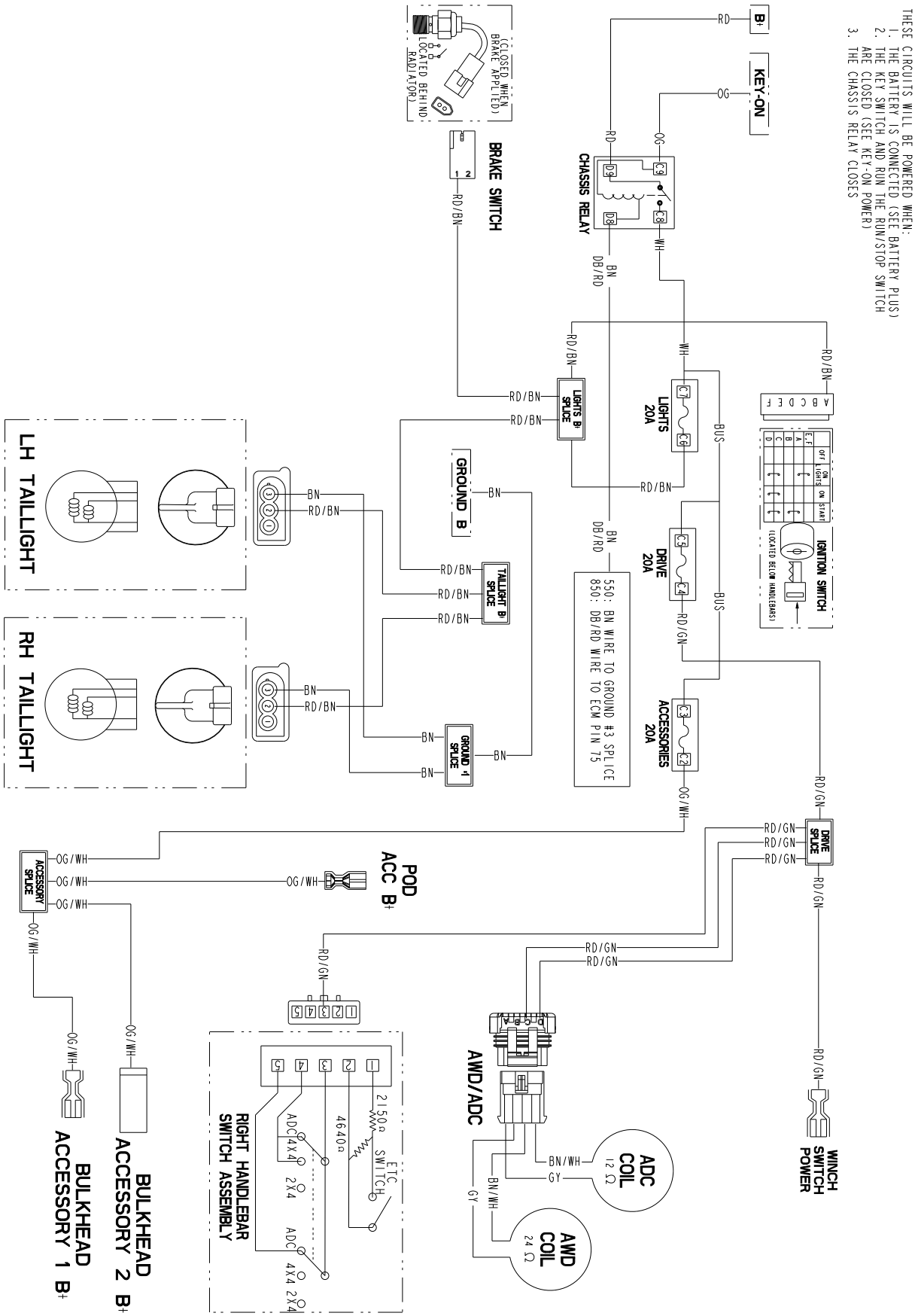
© Copyright 2010 Polaris Sales Inc.

Chassis Power Circuits



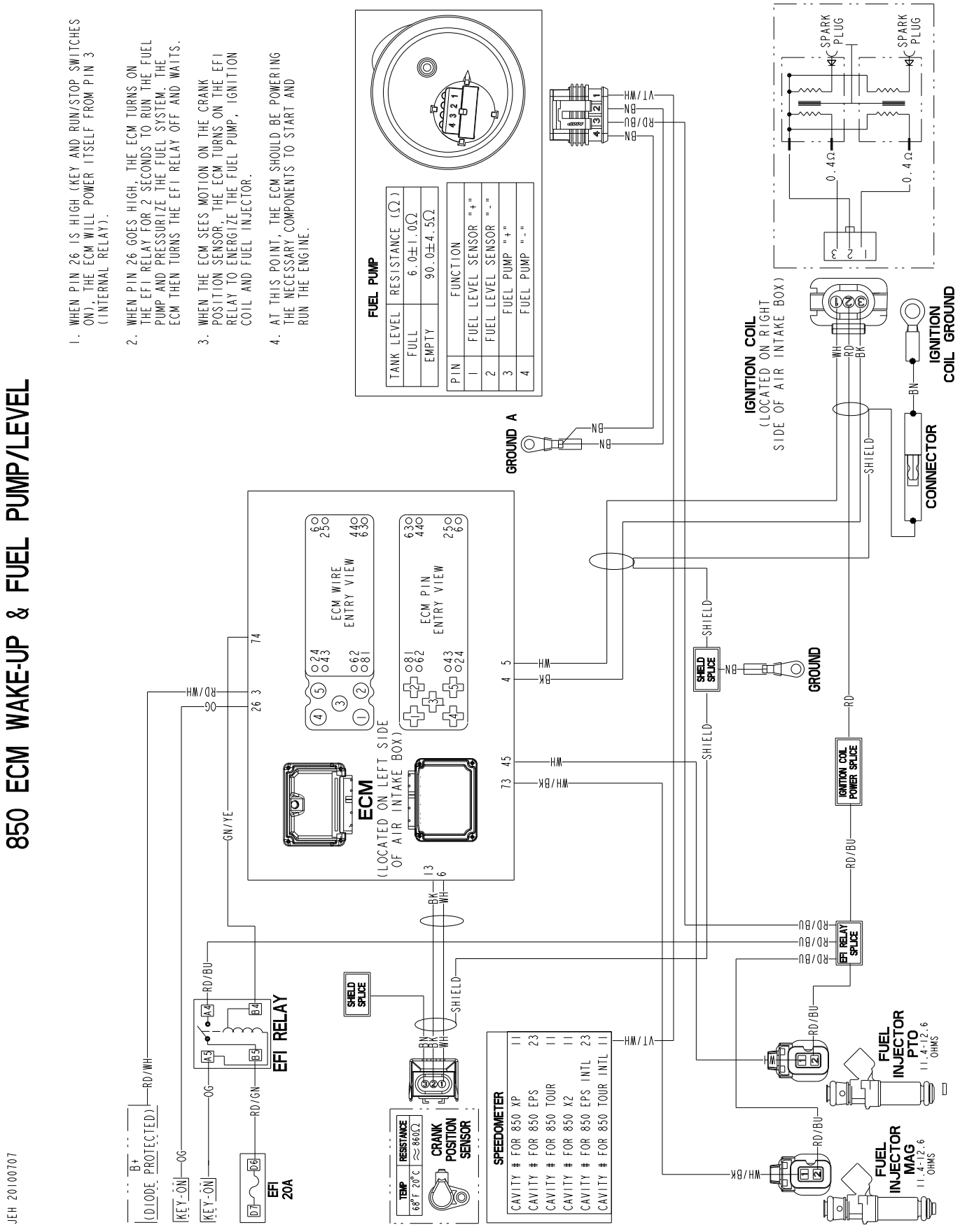
9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

Chassis Power Circuits (Int'l Models)



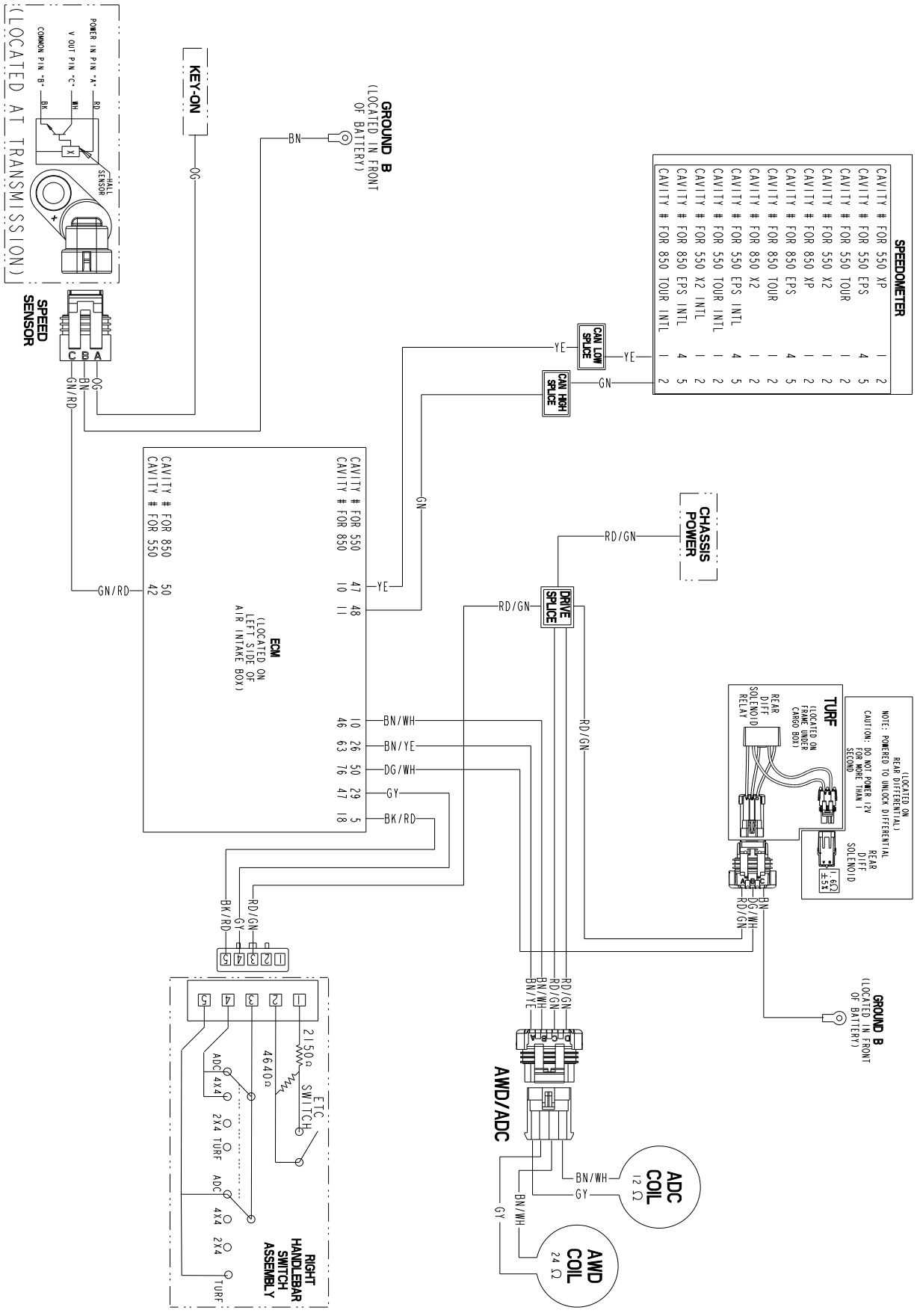
9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

ECM Wake-Up Command and Fuel Pump / Fuel Level Circuits


850 ECM WAKE-UP & FUEL PUMP/LEVEL
1. WHEN PIN 26 IS HIGH (KEY AND RUN/STOP SWITCHES ON), THE ECM WILL POWER ITSELF FROM PIN 3 (INTERNAL RELAY).
2. WHEN PIN 26 GOES HIGH, THE ECM TURNS ON THE EFI RELAY FOR 2 SECONDS TO RUN THE FUEL PUMP AND PRESSURIZE THE FUEL SYSTEM. THE ECM THEN TURNS THE EFI RELAY OFF AND WAITS.
3. WHEN THE ECM SEES MOTION ON THE CRANK POSITION SENSOR, THE ECM TURNS ON THE EFI RELAY TO ENERGIZE THE FUEL PUMP, IGNITION COIL AND FUEL INJECTOR.
4. AT THIS POINT, THE ECM SHOULD BE POWERING THE NECESSARY COMPONENTS TO START AND RUN THE ENGINE.
FUEL PUMP
TANK LEVEL | RESISTANCE (Ω)
FULL | 6.0±1.0Ω
EMPTY | 90.0±4.5Ω
PIN | FUNCTION
1 | FUEL LEVEL SENSOR "+"
2 | FUEL LEVEL SENSOR "-"
3 | FUEL PUMP "+"
4 | FUEL PUMP "-"
SPARK PLUG
SPARK PLUG
0.4Ω
0.4Ω
IGNITION COIL
(LOCATED ON RIGHT SIDE OF AIR INTAKE BOX)
IGNITION COIL GROUND
CONNECTOR
GROUND A
GROUND
SHIELD SPLICE
SHIELD SPLICE
ECM
(LOCATED ON LEFT SIDE OF AIR INTAKE BOX)
ECM WIRE ENTRY VIEW
ECM PIN ENTRY VIEW
IGNITION COIL POWER SPLICE
EFI RELAY SPLICE
EFI RELAY
EFI 20A
CRANK POSITION SENSOR
TEMP 68°F 20°C
RESISTANCE ≈ 860Ω
SPEEDOMETER
CAVITY # FOR 850 XP 11
CAVITY # FOR 850 EPS 23
CAVITY # FOR 850 TOUR 11
CAVITY # FOR 850 X2 11
CAVITY # FOR 850 EPS INTL 23
CAVITY # FOR 850 TOUR INTL 11
FUEL INJECTOR PTO
11.4-12.6 OHMS
FUEL INJECTOR MAG
11.4-12.6 OHMS
B+ (DIODE PROTECTED)
KEY-ON
KEY-ON
RD/WH
OG
RD/GN
RD/BU
GN/YE
WH
BK
WH/BK
VT/WH
RD/BU
SHIELD
JEH 20100707

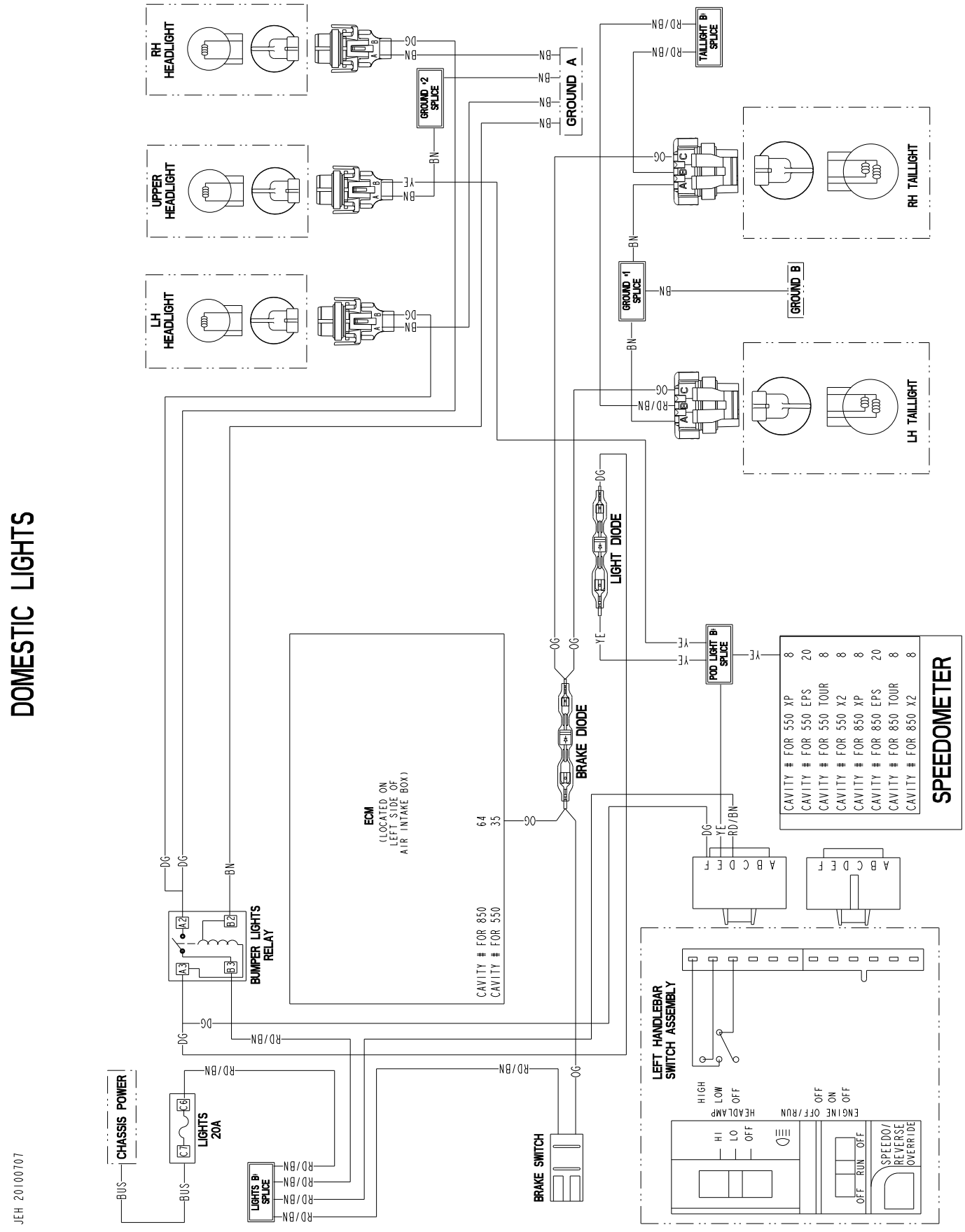
9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

AWD / ADC / TURF and Ground Speed Sensor Circuits



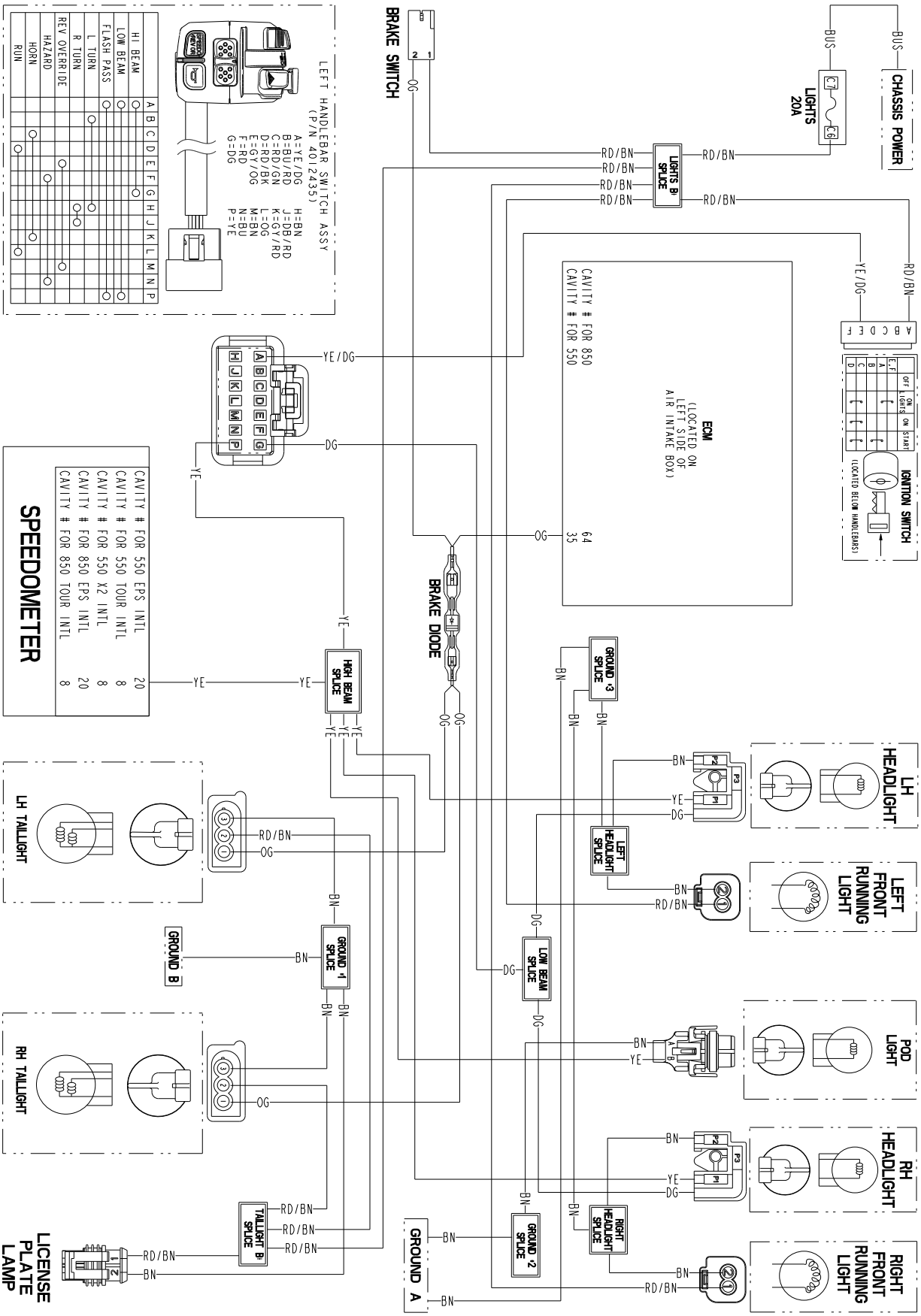
9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

Light Circuits



9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

Light Circuits (Int'l Models)

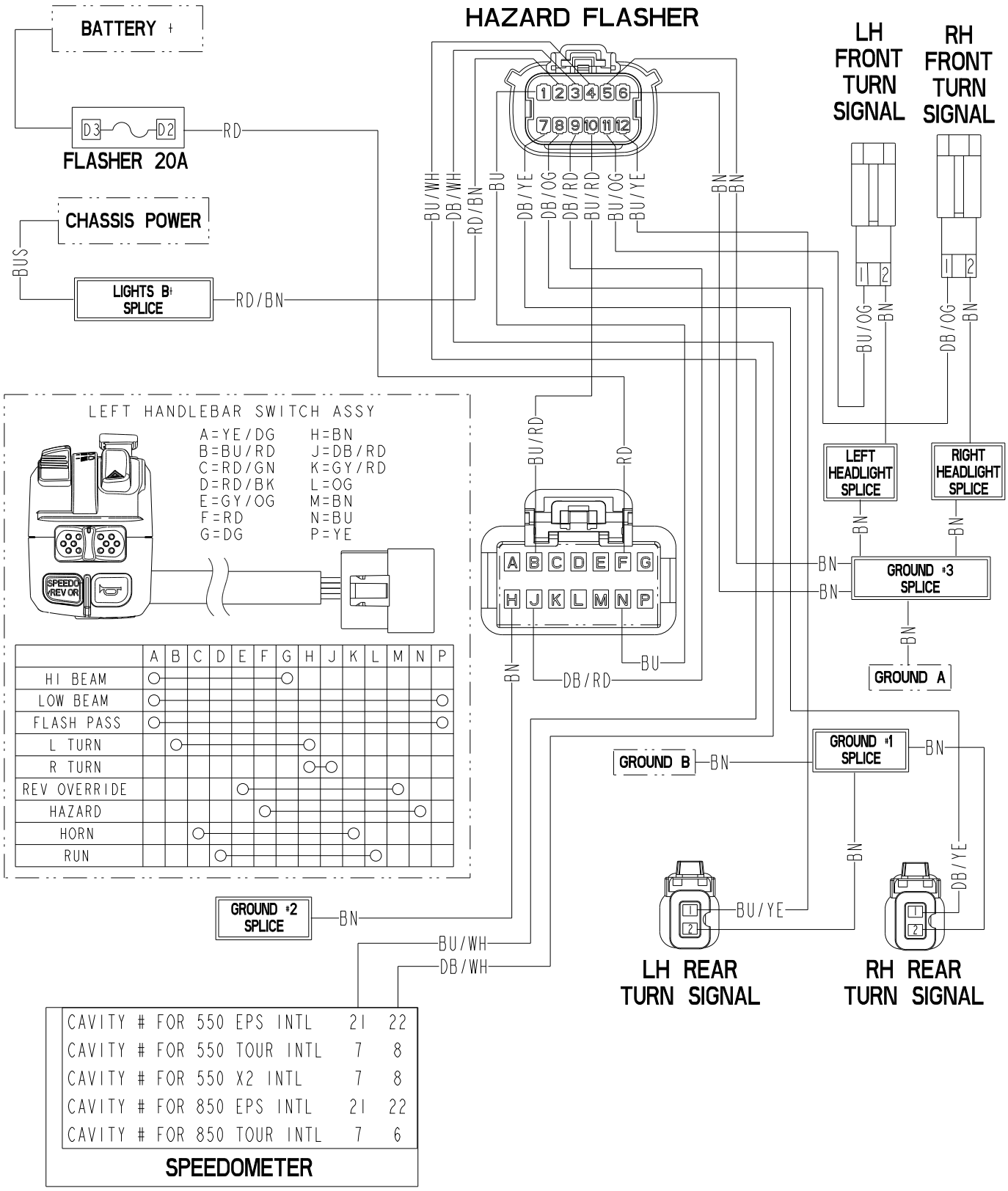


9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.

Turn Signals / Hazard Lights (Int'l Models)

JEH 20100813

TURN/HAZARD



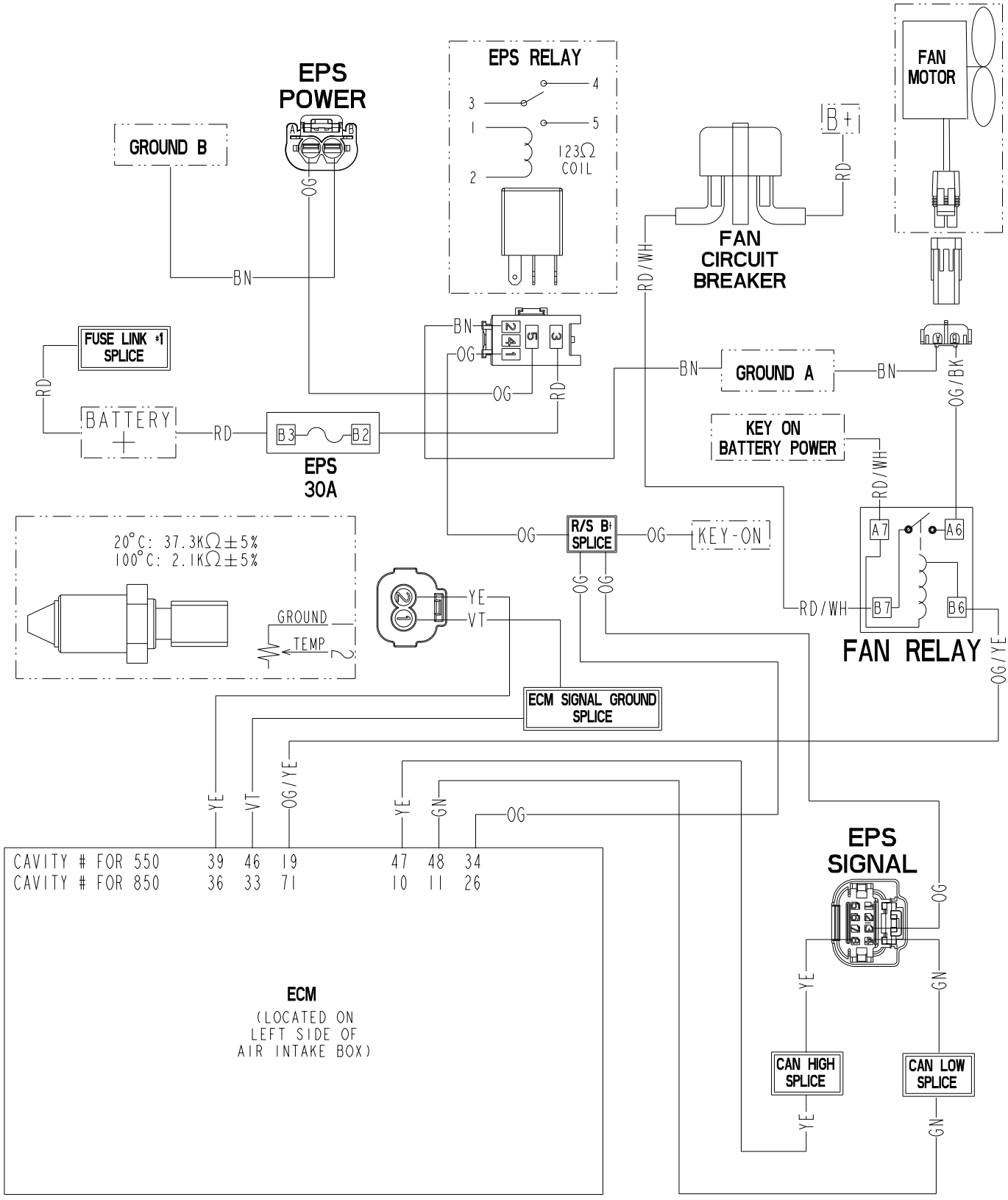
	A	B	C	D	E	F	G	H	J	K	L	M	N	P
HI BEAM	○						○							
LOW BEAM	○													○
FLASH PASS	○													○
L TURN		○						○						
R TURN								○	○					
REV OVERRIDE					○							○		
HAZARD						○							○	
HORN			○							○				
RUN				○							○			

© Copyright 2010 Polaris Sales Inc.

Cooling Fan and Electronic Power Steering Circuits

JEH 20100707

COOLING FAN & EPS



© Copyright 2010 Polaris Sales Inc.

CONTROLLER AREA NETWORK (CAN)

Overview

This vehicle uses a Controller Area Network (CAN) to perform some functions. Similar to a computer network, CAN establishes a communication network between the ECM and several on-board components.

The CAN network includes:

- ECM
- Instrument Cluster
- Digital Wrench Diagnostic Plug
- Electronic Power Steering (EPS models only)

NOTE: DO NOT SPLICE OR CUT INTO THE CAN YELLOW OR GREEN WIRE CIRCUITS.

CAN Troubleshooting

No CAN functionality can be indicated by the following items not working on the instrument cluster:

- No engine speed displayed
- No vehicle speed displayed
- No gear position displayed
- Odometer / Tripmeters not working
- Reverse override button does not toggle between display modes
- ECM-monitored inputs are not displayed when DTCs or problems exist, i.e. check engine LED, engine overheat LED, etc.
- There is power at the Smart Link connector, but it cannot connect to Digital Wrench

To test the CAN circuit, turn the ignition key to OFF, and then use a multimeter to verify there is 60 +/- 10 ohms between the CAN High (YELLOW) and CAN Low (GREEN) wires on the diagnostic connector.

If 120 ohms is measured at the connector, there is a break somewhere within the CAN circuit.

9923067 - 2011 Sportsman 850 Service Manual
© Copyright 2010 Polaris Sales Inc.